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73 AMATEUR RADIO

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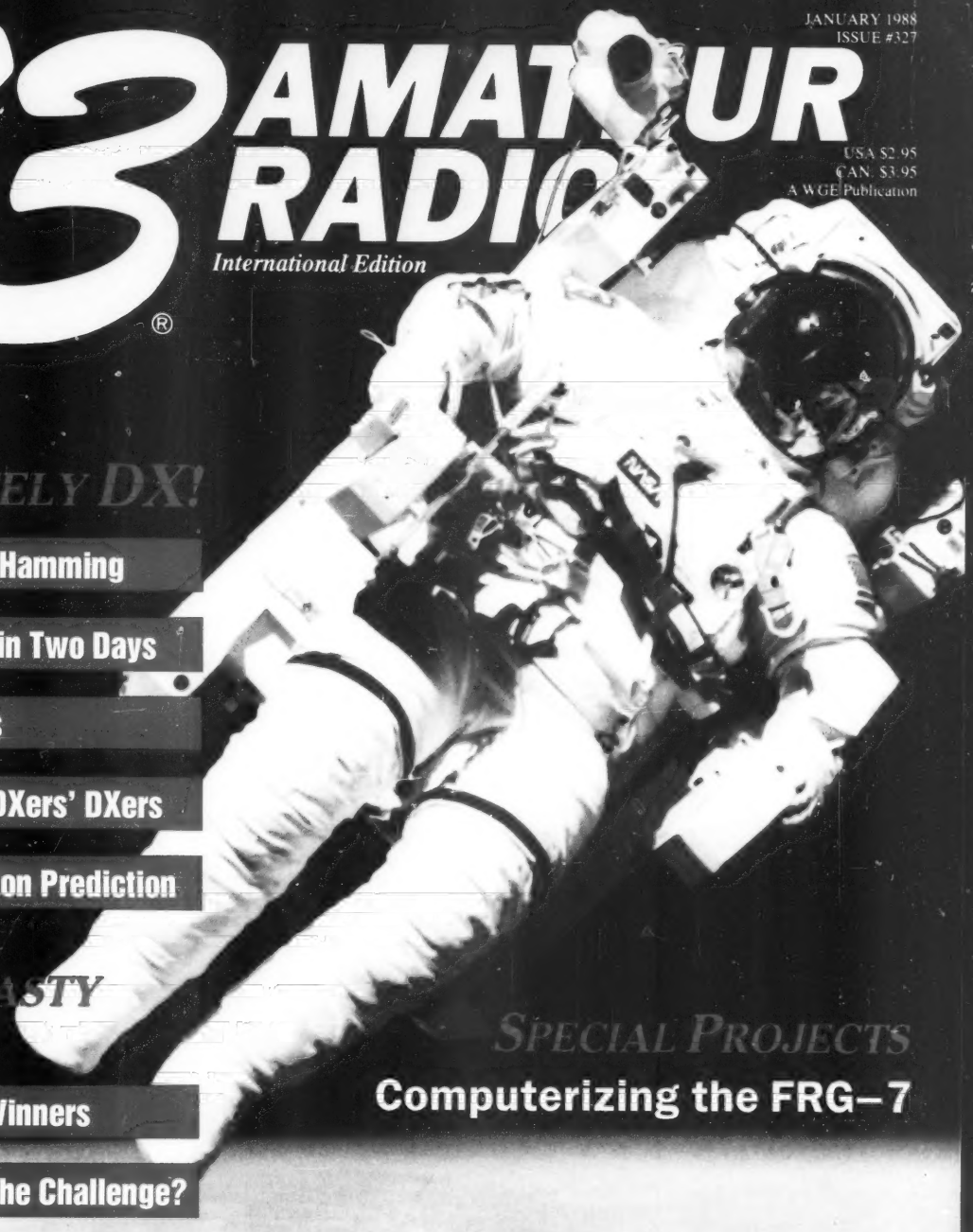

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- Long-distance Hamming
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- Novice DX Tips
- The Colvins—DXers' DXers
- Easy Propagation Prediction

DX DYNASTY AWARD

- The First 100 Winners
- Can You Meet the Challenge?

SPECIAL PROJECTS

Computerizing the FRG–7

PULLOUT EXTRAS

DX Net Schedule and
DXDA Country List

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CIRCLE 12 ON READER SERVICE CARD

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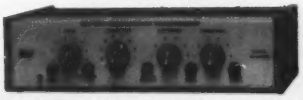
RECEIVER ANTENNA TUNER/PREAMPLIFIER

MFJ-959B $89.95



Impedance match your antenna to your receiver to increase your signal strength with this MFJ-959B and you may hear signals that you didn't even know were there. A 20 dB preamplifier with gain control boosts weak stations and a 20 dB attenuator prevents overload. It has switches for selecting between two receivers and two antennas. Covers 1.8 to 30 MHz. 9x2x6 inches. Uses 12 VDC or 110 VAC with MFJ-1312, $9.95.

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CIRCLE 24 ON READER SERVICE CARD

Welcome, Newcomers!

AMATEUR RADIO DEMYSTIFIED

Welcome to Amateur Radio! Since you're reading this, chances are you've just gotten your amateur license, or are seriously thinking about it.

Like any technical hobby, however, ours is full of techspeak, acronyms, and jargon that can really put off a newcomer. I recall getting my "ticket" and tuning around on an amateur band on my old Philco radio for nice slow code. After finding and copying it, less than one-tenth of it was comprehensible! I knew I wasn't dyslexic, discounted Alzheimer's disease because of age (18), and was told by a native that it wasn't Czech. I resigned myself to the fact that Amateur Radio had its own language, and I had to learn it.

Fortunately, there were fellow hams around me who wouldn't let me believe that it was hard, and, after a short time, I had too much fun to notice. A week after getting my ticket, I made my first international contact in Morse code, with a schoolteacher south of Sao Paulo, Brazil. Contacts with Argentina, Finland, Japan, and Australia followed shortly, and ham jargon and acronyms showed themselves to be the link between people with no other common language; a kind of radio Esperanto. These once alien words and symbols became bonding ones. The system that first restricted me became a liberating one.

You will hopefully have the company of enthusiastic hams like I did to ease your entry into the hobby. Meanwhile, use the following format as a key into our fascinating world.

ANATOMY OF A CONTACT

Most ham contacts follow a standardized format, and there are good reasons for it. Mike fright—not knowing what to say—is a *common* problem. Many new hams besides you, and even a surprising number of veterans, suffer from it. This isn't surprising when you consider that you're meeting someone for the first time and are still unfamiliar with the equipment, and many of us are naturally shy. It really helps to be able to start off with a protocol that soon becomes automatic. This lets you think about what you're going to say next while tuning your antenna, making final tuning adjustments on your rig, etc.

See the glossary in the December Issue for unfamiliar terms.

To Call

First tune to a clear frequency, making sure that it is in within your license class restrictions. Then, to be sure, call "Is this frequency in use from (your call)"?, or send "QRL?" Allow 5–10 seconds for a response. Repeat this procedure. If there's no response, call or send the letters "CQ" ("seek you") 6–8 times followed by your call, twice. If you're on voice, and conditions are poor, give your call phonetically, e.g. "this is 'Kilo- Alpha-One-Hotel-Yankee' for KA1HY. There are several common phonetics for each letter, which you will soon get to know.

Joe Ham will respond by first giving your call several times followed by his call. If conditions are poor, he may then say, "Do you copy?" or send "QSL?" and wait for you to respond. If conditions are better, Joe will probably just continue with a little about himself after responding to your call.

A Little About Joe

We have a tendency to forget to give details about ourselves that we consider boring, because we repeat them with each new contact. We need to remind ourselves that these details help the other person identify with us. To keep ourselves in line, we continue to follow a format.

Joe goes on by giving his name, prefaced in CW by "NAME IS . . ." He then sends "QTH IS . . ." followed by his location.

At this point, he will likely send your signal report. Code reports in CW have three parameters—"Readability, Strength, and Tone"—and are prefaced by "UR RST IS . . ." Readability follows a scale of 1 to 5, and the other parameters run between 1 and 9. In practice nowadays on CW, only the first two characters ("Readability" and "Strength") vary, since most rigs produce an excellent CW tone. "9" is often shortened to "N", e.g. an RST of "599" is sent "5NN". Voice contact reports are two characters; "Readability" and "Strength." It is often given with an "and" in between; e.g. "5 and 9."

"A good wrap-up puts a nice cap on a contact."

After this, Joe then says "How Copy?" or sends "QSL?" and you take up the mike/key and repeat exactly his transmission format.

After this, it's your choice what to talk about. Many hams' next step is to describe their station: My rig is . . ., my antenna is . . . and is up "X" number of feet, etc. If you're familiar with Joe's QTH, you can talk about it. If you're not familiar with it, you can *still* talk about it. Tell him about your other hobbies, and ask him about his. Ditto for work, family, books read, movies seen, places visited, etc. The list of topics is endless. After the contact, you'll wonder why you ever had mike fright!

Finishing the Contact

A good wrap-up puts a nice cap on a contact. Good procedure keeps the contact from ending too abruptly or dragging out.

The hardest part for most is being the first to say you have to QRT (exit). Once that hump is hurdled, you turn the mike to him. He thanks you for the contact and turns it back to you. You then thank Joe for an excellent contact, say "73s," and tell him you "will QSL" (send a card of acknowledgement), and will look for his. You then say "Over to you for your final (words), Joe." He will return and say "Thanks again and 73s. This is (his call), clear." You finish your transmission by saying "This is (your call), clear."

Remember, these patterns aren't cast in stone—they're meant only to get you started! Good Luck!

. . . de KA1HY

"Q" SIGNALS

The language of amateur radio is riddled with strange three-letter words beginning with "Q"—you may have noticed that four of our monthly departments are titled with 'em.

They first came into being in the code-only days as a way to reduce common questions and statements to a short code and make communications more efficient. "Q" was likely chosen as the first letter because it's the least common letter in the alphabet, and always always followed by "U"—if it was followed by anything else, it was a sure bet that it was a code.

"Q" signals can be either questions or statements. Here are the most common ones, followed by an example:

QRL—"Are you busy? I am busy." Send this to see if a frequency is clear.

QRM—"Is my transmission interfered with? Your transmission is being interfered with." Often said "Q-R-Mary" to distinguish it from QRN.

QRN—"Are you troubled by static? I am being troubled by static." Often said "Q-R-Nancy."

QRP—"Shall I decrease power? Decrease power." There are some hams devoted to elegance of low-power operation. Mike Bryce WB8VGE devotes his QRP column to them.

QSB—"Are my signals fading? My signals are fading." Often said "Q-S-Baker." "There's a lot of QSB on the band."

QSL—"Do you copy me, do you acknowledge? I copy, I acknowledge." Hams exchange QSL cards to verify their contacts with each other. See "QSL of the Month" on page 6 for colorful and imaginative examples of these.

QSO—Conversation. "Thanks for the QSO, Old Man."

QSY—"Shall I change frequency? Change frequency." "Let's QSY up 5 kHz."

QTH—Location. "My QTH is Peterborough, NH."

QRX—"When will you call me again? I will call you at (hours) on (kHz)." Our QRX column is devoted to Amateur Radio news.

QRT—"Shall I stop sending? Stop sending." "The phone's ringing, I must QRT."

JUST PLAIN JARGON

What's a language without fun words and endearments? Following is a list of a few of ours. (Again, most descend from the CW-only days.)

DX—Long Distance

On HF this could mean contacts outside a ham's own country, but on VHF/UHF DX could be the next county.

OM—Old Man

Man of any age.

YL—"Young Lady"

Unmarried woman of any age.

XYL—"Ex Young Lady"

Wife.

Harmonics—Children of the OM and the XYL.

88s—Hugs and kisses.

And lastly . . .

73s—the very best to you! Enjoy our magazine!

73 AMATEUR RADIO

JANUARY 1988 Issue # 328

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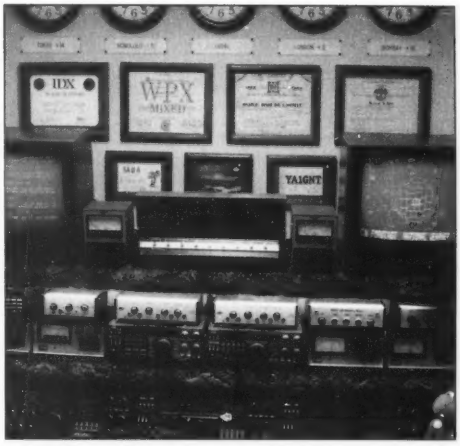

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FEEDBACK... FEEDBACK! It's like being there—right here in our offices! How? Just take advantage of our FEEDBACK card on page 96. You'll notice a feedback card number at the beginning of each article and column. We'd like you to rate what you read so that we can print what types of things you like best. And then we will draw one Feedback card each month for a free subscription to *73*

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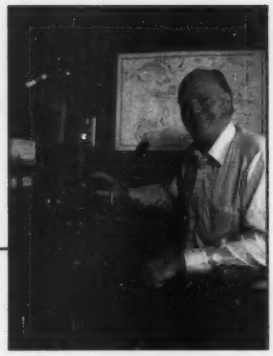
Cover Photo: Compliments of NASA. Astronaut Bruce McCandless II, a 41-B mission specialist, a few meters away from the cabin of the shuttle Challenger in a manned maneuvering unit using no restrictive tethers.

NEVER SAY DIE

Wayne Green W2NSD/1



THE WAY WE WERE

You aren't any more anxious than I for *73* to get back the way it was a few years ago—when the fast growth of FM and repeaters were a bonanza for the ham industry, providing the advertising it takes to support a fatter magazine. The formula for this is simple—magazines have to run abut 50% advertising to survive. Thus, for a 200-page magazine we need a hundred pages of ads.

If you'd like to see *73* back the way it was with 200-page issues, you can have 'em. The advertisers are looking for your business, so they're putting their ads where they hope you'll see them. In a perfect world advertisers would always make sure they knew where their orders were coming from and run their ads where they would bring them the most business.

What's actually happened is that the easy way out is to run ads in *QST*, since they have the most subscribers. Companies which can survive on the business they get that way do—the others gradually fade away.

It should not come as a news flash to you that the readership of the four ham magazines don't overlap 100%. The *QST* readers tend to be older hams, hams who already have their ham gear and are living on retirement incomes which keep their purchases of new equipment low.

CQ is read by the contest oriented hams, who are generally more interested in contests and certificates than buying ham gear. They're good for an occasional mammoth antenna system, the better to blow away the pileups.

Ham Radio interests the engineers with its complicated construction projects and in-depth engineering articles. These chaps prefer to build their stuff, which is fine for parts sellers, but of less value to equipment manufacturers.

73 is aiming at making amateur radio more fun for the active ham—particularly the ham who's interested in new modes and technologies. I pioneered single sideband in the 60s—then slow scan television. When I saw the potential for repeaters I pushed hard with hundreds of articles, book after book, repeater seminars around the country and a special FM repeater magazine. It worked, making repeaters the #1 ham activity. . . and all this with virtually zero help from any of the other ham magazines.

I started *73* back in 1960 because I felt there should be one ham magazine devoted to making ham radio fun. I concentrated on simple construction projects and covering new technologies. *73* was the first with nuvistors and pioneered the ham use of transistors. When ICs came along I published articles on the basics which were later reprinted in book form for computer hobbyists.

73 was first with computer articles. The ham enthusiasm for computers was what got me to start *Byte* magazine. . . which went on to *Microcomputing*, *80-Micro*, *In Cider*, *Run*, *Hot CoCo*, *Desktop Computing*, *Micro Industry*, *Selling Micros* and so on.

Between the lack of newcomers in our hobby (a 10% drop per year for the last few years)—the enervating effect of the low sunspots and a lack of new communications modes, hams haven't been buying as much equipment and this has been reflected in a drop in advertising which has thinned all the ham magazines.

The ham manufacturers and dealers will advertise where they think it brings them the most business, so if you mention *73* when you contact them, you'll see *73* growing again. If you don't they'll assume *QST* brought the sale and you'll have more exciting club news and section reports to read.

One way to make a difference is to rip out the *73* reader's service card, circle the products you're in-

Continued on page 18

QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, 70 Rte. 202 N., Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

QRM

Editorial Offices
WGE Center
Peterborough NH 03458-1194
phone: 603-525-4201

Advertising Offices
WGE Center
Peterborough NH 03458-1194
phone: 800-225-5083

Circulation Offices
WGE Center
Peterborough NH 03458-1194
phone : 603-525-4201

Manuscripts

Contributions in the form of manuscripts with drawings and/or photographs are welcome and will be considered for possible publication. We can assume no responsibility for loss or damage to any material. Please enclose a stamped, self-addressed envelope with each submission. Payment for the use of any unsolicited material will be made upon acceptance. A premium will be paid for accepted articles that have been submitted electronically (CompuServe ppn 70310,775 or MCI Mail "WGEPUB") or on disk as an IBM-compatible ASCII file. All contributions should be directed to the *73* editorial offices. "How to Write for *73*" guidelines are available upon request. US citizens must include their social security number with submitted manuscripts.

Subscription Information

Rates: in the United States and Possessions: One Year (12 issues) $24.97; Two Years (24 issues) $45.47. Elsewhere: Canada and Mexico—$39.00/1 year only, US funds. Foreign surface mail—$45.00/1 year only, US funds drawn on US bank. Foreign air mail—please inquire. To subscribe, renew or change an address: Write to Subscription Department, PO Box 931, Farmingdale NY 11737. Return postage guaranteed. For renewals and changes of address, include the address label from your most recent issue of *73*. For gift subscriptions, include your name and address as well as those of gift recipients. For questions concerning your subscription, call toll free 1-800-227-5782. To place subscription orders, please call us toll free at 1-800-722-7790 between 9 am and 4:30 pm Eastern time or write to *73*, Subscription Department, PO Box 931, Farmingdale NY 11737. ***73 Amateur Radio*** (ISSN 0745-080X) is published monthly by WGE Publishing, WGE Center, Peterborough NH 03458-1194. Second class postage paid at Peterborough NH 03458 and at additional mailing offices. Canadian second class mail registration number 9566.

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Legal Contract: Merely touching this magazine, even momentarily or accidentally, is legal evidence of a binding contract between you and the publisher. Under this contract you hereby agree to fill out the 73 reader's service card, mark several ads which you're interested in knowing more about, and send it to 73. Further (we're not done yet), you agree to write Wayne and let him know if you got your information and how long it took. We'll get those advertisers on the stick yet.

KENWOOD

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3 Choices
70 W/45 W/25 W

Three Choices for 2m!

TM-2570A/2550A/2530A

Feature-packed 2m FM transceivers

The all-new "25-Series" gives you three RF power choices for 2m FM operation: 70 W, 45 W, and 25 W. Here's what you get:

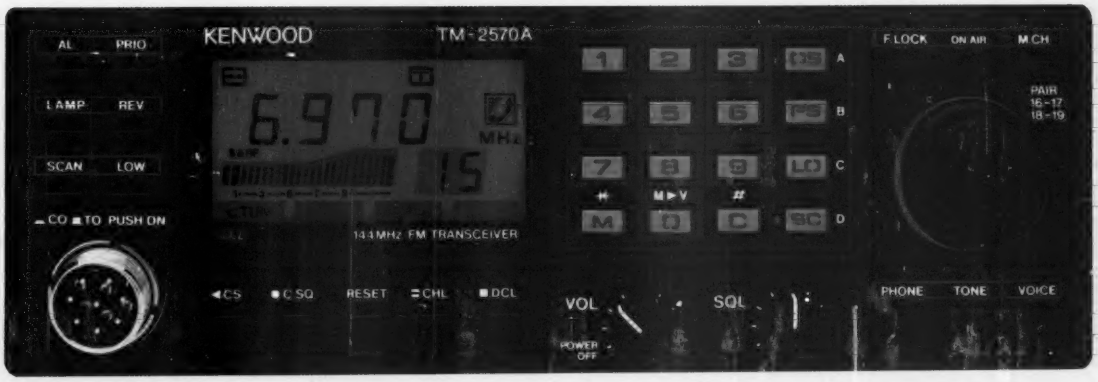
- Telephone number memory and autodialer (up to 15 seven-digit phone numbers). **A Kenwood exclusive!**
- High performance GaAs FET front end receiver
- 23 channel memory stores offset, frequency, and subtone. Two pairs may be used for odd split operation
- 16-key DTMF pad with audible monitor
- Extended frequency coverage for MARS and CAP (142-149 MHz; 141-151 MHz modifiable)
- Center-stop tuning—**a Kenwood exclusive!**

- New 5-way adjustable mounting system
- Automatic repeater offset selection—**another Kenwood exclusive!**
- Direct keyboard frequency entry
- Front panel programmable 38-tone CTCSS encoder **includes** 97.4 Hz (optional)
- Big multi-color LCD and back-lit controls for excellent visibility
- The TM-3530A is a 25 watt version covering 220-225 MHz. The first full featured 220 MHz rig!

DCL **Introducing... Digital Channel Link**

Compatible with Kenwood's DCS (Digital Code Squelch), the DCL system enables your rig to **automatically** QSY to an open channel. Now you can automatically switch over to a simplex channel after repeater contact! Here's how it works:

The DCL system searches for an open channel, remembers it, returns to the original frequency and transmits control information to another DCL-equipped station that switches **both** radios to the open channel. Microprocessor control assures fast and reliable operation. The whole process happens in an instant!



Actual size front panel

Optional Accessories

- **TU-7** 38-tone CTCSS encoder
- **MU-1** DCL modem unit
- **VS-1** voice synthesizer
- **PG-2N** extra DC cable
- **PG-3B** DC line noise filter
- **MB-10** extra mobile bracket
- **CD-10** call sign display
- **PS-430** DC power supply for TM-2550A/2530A/3530A
- **PS-50** DC power supply for TM-2570A
- **MC-60A/MC-80/MC-85** desk mics.
- **MC-48B** extra DTMF mic. with UP/DWN switch
- **MC-43S** UP/DWN mic.
- **MC-55** (8-pin) mobile mic. with time-out timer
- **SP-40** compact mobile speaker
- **SP-50B** mobile speaker
- **SW-200A/SW-200B** SWR/power meters
- **SW-100A/SW-100B** compact SWR/power meters
- **SWT-1** 2m antenna tuner

Complete service manuals are available for all Kenwood transceivers and most accessories.
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Specifications guaranteed on Amateur bands only.

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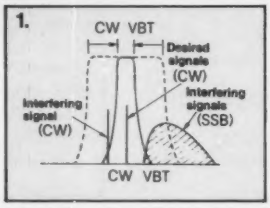
DX-cellence!

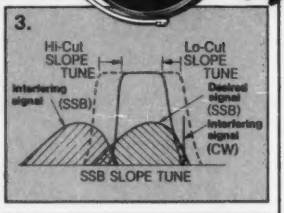
TS-940S

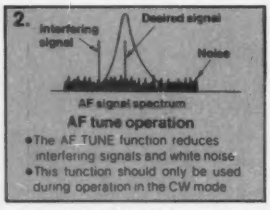
Competition class HF transceiver

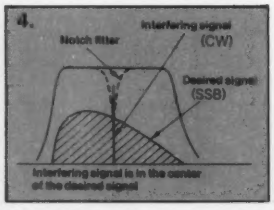
TS-940S—the standard of performance by which all other transceivers are judged. Pushing the state-of-the-art in HF transceiver design and construction, no one has been able to match the TS-940S in performance, value and reliability. The product reviews glow with superlatives, and the field-proven performance shows that the TS-940S is "The Number One Rated HF Transceiver!"

- **100% duty cycle transmitter.** Kenwood specifies transmit duty cycle ***time.*** The TS-940S is guaranteed to operate at full power output for periods ***exceeding one hour.*** (14.250 MHz, CW, 110 watts.) Perfect for RTTY, SSTV, and other long-duration modes.
- **First with a full one-year limited warranty.**
- **Extremely stable phase locked loop (PLL) VFO.** Reference frequency accuracy is measured in ***parts per million!***






2.
Interfering signal
Desired signal
Noise
AF signal spectrum
AF tune operation
•The AF TUNE function reduces interfering signals and white noise.
•This function should only be used during operation in the CW mode



1) CW Variable Bandwidth Tuning. Vary the passband width continuously in the CW, FSK, and AM modes, without affecting the center frequency. This effectively minimizes QRM from nearby SSB and CW signals.

2) AF Tune. Enabled with the push of a button, this CW interference fighter inserts a tunable, three pole active filter between the SSB/CW demodulator and the audio amplifier. During CW QSOs, this control can be used to reduce interfering signals and noise, and peaks audio frequency response for optimum CW performance.

3) SSB Slope Tuning. Operating in the LSB and USB modes, this front panel control allows independent, continuously variable adjustment of the high or low frequency slopes of the IF passband. The LCD sub display illustrates the filtering position.

4) IF Notch Filter. The tunable notch filter sharply attenuates interfering signals by as much as 40 dB. As shown here, the interfering signal is reduced, while the desired signal remains unaffected. The notch filter works in all modes except FM.

- **Complete all band, all mode transceiver with general coverage receiver.** Receiver covers 150 kHz-30 MHz. All modes built-in: AM, FM, CW, FSK, LSB, USB.
- **Superb, human engineered front panel layout for the DX-minded or contesting ham.** Large fluorescent tube main display with dimmer; direct keyboard input of frequency; flywheel type main tuning knob with optical encoder mechanism all combine to make the TS-940S a joy to operate.
- **One-touch frequency check (T-F SET) during split operations.**
- **Unique LCD sub display indicates VFO, graphic indication of VBT and SSB Slope tuning, and time.**
- **Simple one step mode changing with CW announcement.**
- **Other vital operating functions.** Selectable semi or full break-in CW (QSK), RIT/XIT, all mode squelch, RF attenuator, filter select switch, selectable AGC, CW variable pitch control, speech processor, and RF power output control, programmable band scan or 40 channel memory scan.

Optional accessories:
• AT-940 full range (160-10m) automatic antenna tuner • SP-940 external speaker with audio filtering • YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters; YK-88A-1 (6 kHz) AM filter • VS-1 voice synthesizer • SO-1 temperature compensated crystal oscillator • MC-43S UP/DOWN hand mic. • MC-60A, MC-80, MC-85 deluxe base station mics. • PC-1A phone patch • TL-922A linear amplifier • SM-220 station monitor • BS-8 pan display • SW-200A and SW-2000 SWR and power meters • IF-232C/IF-10B computer interface.

Complete service manuals are available for all Kenwood transceivers and most accessories.
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QRX . . .

EDITED BY BRYAN HASTINGS KA1HY

VEC Scandal

Recent events have blemished the VEC program. In an unprecedented action, the FCC notified all Volunteer Examiner Coordinators (VECs) with amateur radio operator testing teams in the Caribbean that it will no longer accept the services of any accredited volunteer examiner in VEC Testing Region 12. All amateur testing operations were ordered suspended last October amidst suspected licensing irregularities in that region.

John B. Johnson W3BE, Chief of the FCC Personal Radio Branch, cancelled the accreditation of all Region 12 VEs "because of widespread irregularities in the VEC system in Puerto Rico . . ." The action was taken in accordance with Part 515b of the rules which permit the government to decline the services of volunteer examiners certified by a VEC.

The FCC has been concerned with events in Puerto Rico for a long time. Ray Kowalski, Chief of the Special Services Division, cited at the 1986 Conference of VECs in Washington, DC in August that pass rates in Region 12 are abnormally high. While the total number of individual US amateur radio operators increased by less than 3½% since January 1986, the Puerto Rican amateur census during the same period is up nearly 50%.

On October 5, 1987, the FCC asked all region 12 VECs to determine if previously approved examiners should be reaccredited. "Those VEs whose performance is suspect should be dropped from accreditation . . . only those VEs in whose integrity you have absolute confidence" should be accredited, Johnston said.

Both the ARRL and the W5YI VEC programs notified every VE in Puerto Rico of their separation from the program.

The FCC has active ongoing investigations concerning suspected fraudulently-held VEC system test sessions in Puerto Rico. The Extra-Class VEs could face license revocation proceedings. There are several involved.

The Novice test program in VEC Region 12 is unaffected, however. They are tested under a completely separate program.

Canada-DA-DA!

The Canadian Federal Department of Communications announced the signing of an amateur third-party and reciprocal operating agreement between Canada and the USSR. This historic agreement became effective on November 1, 1987, and will be in existence until after the conclusion of the expedition next year.

The "Polar Bridge" USSR/Canadian ski expedition will cross the North Pole from Severnaya Zemlya to Cape Columbia on Ellesmere Island beginning in February 1988.

Guy Roy, a Radio Inspector for the DOC in Ottawa, stressed that this agreement applies *only* to the polar trekkers and the people authorized to contact them.

PRB-1 Challenge

In 1985, Boulder County Amateurs believed they had won a major victory in the battle for effective antennas when the county specifically exempted Amateur installations from the definition of a "telecommunications element" under the Boulder County Comprehensive Plan. The Plan even states that "Amateur antenna installations shall be exempt from height restrictions."

Boulder County hams Doc Evans NQ0I and Tim Holzheimer N6DIY, applied for building permits to erect 125-foot antennas in a rural residential subdivision of Boulder County early last year. Because their towers would be base-fed, their entire installations can properly be termed antennas, and so fall completely within the no-height restriction definition given in the Plan above. Therefore, they didn't believe they needed to apply for a variance to the County Zoning Resolution—derived directly from the Plan—which limits the height of structures in the County to 35 feet.

Robert Helmick, the County Zoning Administrator, saw matters differently. Even though the towers themselves were also *active antenna elements,* he deemed them *structures* (all installations which are not amateur antennas), and so are limited to 35 feet. He also stated that PRB-1 did not apply in this case, since he interpreted PRB-1 as meaning that "local governments cannot prohibit amateur activity, but that they are free to impede amateur activities."

Local hams are taking this issue to the Federal District Court. If a case like this is allowed to stand, it will set a dangerous precedent to all other local governments in the country. The Boulder Antenna Fund desparately needs money to take this clear-cut case to court. They have about $7,000, but they need at least $15,000 to retain the required legal fees. Please send donations to:

Boulder Antenna Fund
c/o Barbara McClure N0BWS
5338 Spotted Horse Trail
Boulder CO 80301
(303) 530-1872

EME Records

Early reports suggest a number of significant records were established during the EME weekend of October 17. In one of the highlights of the event, a group of amateurs operated the 140-foot polar mount dish at the National Radio Astronomy Observatory at Greenbank, West Virginia. There may be a new world record for 13cm DX. According to ZL1AOX, ZL2AQE in Wellington worked Greenbank via the moon using 5 to 6 Watts and a 4-meter dish. A 10-GHz link between Greenbank and Italy was also to be attempted.

Phantom Phones

"Phantom dialing" in some cordless telephones is playing havoc with the phone system nationwide. Emergency services in several localities have now documented the self-dialing antics of wayward cordless phones. Santa Clara County, California has been logging 30 or more of these phantom calls a month for some time, and a suburban Chicago emergency switchboard director said that his operation receives about a dozen of these calls every 30 days. In most cases, the phones seem to dial simple numbers, such as 411 information, 611 telephone repair, or 911 emergency services. There are documented cases, however, of cordless phones self-dialing long-distance, and even international numbers, much to the surprise and chagrin of their owners when they receive their monthly telephone bills!

A spokesman in the cordless phone industry said that they know no exact cause for this phenomenon, but weak batteries and interference from other sources are distinct possibilities. Keep this in mind the next time you get a call with silence at the other end of the line!

Sahara Stint

The fall DXpedition to the Western Sahara was both an operational and political success, according to DXpeditioners OH2BN and OH2BU. The Lynx Group DXpedition reports over 11,800 QSOs during their stint as S0RASD. This includes 900 contacts to Japan alone! The initial operation concentrated on 20-meter SSB, which then moved for a spell to other bands, including 160 meters. Due to a limited power supply, and other training and social commitments, 24-hour/day operation wasn't possible. Mr. Namma, the Director of Telecommunications for the Western Sahara, proved a very pleasant surprise. He surprised everyone with his natural talent for on-air operation. Namma is fluent in Arabic, French and Spanish, and knows enough English to handle a QSO. It's reported that he will soon be on the air as S01A, to help keep amateur radio alive in the region.

Credits

Thanks for this month's news items go to *Westlink, W5YI Report,* CRRL, AMSAT, and the Boulder Antenna Fund Committee. Keep your news items rolling in!

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NEW!

Ultimate Affordable HT!

TH-205AT

Affordable 5-watt hand-held transceiver. Ultimate Affordability!

It's here now! The affordable, "Kenwood Quality" hand-held transceiver. Standard features include a large, easy-to-read LCD display, wide-range power requirements (operates on 7.2 VDC—16 VDC), 3-channel memory, built-in battery saver circuit, and, when operated on 12 VDC, a robust five watts of power! The die-cast metal rear panel/heat sink assures cool, reliable operation. Receiver frequency coverage from 141—163 MHz is also standard—you can even listen to the "weather channels" at 162.40 or 162.55 MHz!

- Monitor switch—to check frequency when PL encode/decode switch is on.
- Extended frequency coverage for certain MARS and CAP operations.
- 3 memory channels store frequency and offset. And so easy to use! Simply press the memory channel number to recall your favorite channels!
- Night light, offset/reverse.
- 16-key DTMF pad for repeater autopatch is standard.

- NEW! Twist-Lok Positive-Connect™ battery case. A wide range of quick-change commercial duty battery packs are available.

- 12 VDC input terminal—allows direct mobile or external power supply operation. When 12 VDC is applied, power output increases to **5 watts!**

- Heavy-duty final amplifier and heat sink. The die-cast rear panel assures reliable operation. With the optional 12-volt PB-1 battery pack, the TH-205AT provides 5 W output. The standard 8.4 volt PB-2 provides 2.5 W output. (500 mW low power).
- Large, easy-to-read LCD display. Frequency, offset, memory channel, TX, RX, and battery indicator.
- Frequency UP/DOWN keys. Used to select frequency or scanning direction.
- Scan function
- Automatic battery saver circuit extends battery life. No buttons to push!
- Supplied accessories include: Rubber flex antenna, belt hook, 8.4 V, 500 mAH NiCd battery pack, wall charger.

Optional Accessories:

1) PB-1 12 V 800 mAH NiCd batt. pack (5 W output). **2)** PB-2 8.4 V 500 mAH NiCd batt. pack (2.5 W output). **3)** PB-3 7.2 V 800 mAH NiCd batt. pack (1.5 W output). **4)** PB-4 7.2 V 1600 mAH NiCd batt. pack (1.5 W output). **5)** BT-5 AA manganese/alkaline battery case. **6)** BC-7 Rapid charger for PB-1, 2, 3, or 4. **7)** BC-8 Compact battery charger **8)** SMC-30 Speaker microphone. **9)** SC-12, SC-13 Soft cases. **10)** RA-3, RA-5 Telescoping antennas. **11)** RA-8B StubbyDuk antenna • TSU-3 CTCSS encode/decode unit • VB-2530 2 m, 25 W RF power booster • LH-4, LH-5 Leather cases • MB-4 Mobile bracket • BH-5 Swivel mount • PG-2V DC cable • PG-3C Filtered cigar lighter cord.

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Working the World—FAST!

Taller than the dome of the United States Capitol, W6GO's tower is the most striking tool in the DXing kit that won the Golden Jubilee DXCC Award #1.

by Leon Fletcher N6HYK

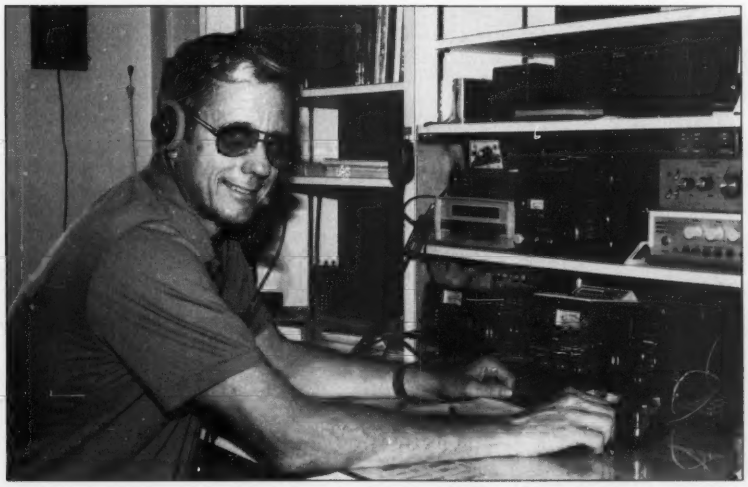


Photo A. "The first time I connected my new (158-foot) tower to this rig and sent a CQ, Europeans didn't stop calling me until the band went out late that night," says Jay O'Brien W6GO.

In the first 2 days and 42 minutes of 1987, Jay O'Brien W6GO of Rio Linda CA, worked 100 DXCC countries—an achievement that brought him an impressive trophy, enthusiastic acclaim by many fellow DXers, and the awe of countless tenderfooted DXers like myself. How could he have worked so many countries so quickly?

Many hams operate for weeks, sometimes months, even years to contact that many countries. If there had been a worldwide DX contest on the air, then working 100 countries in just over two days would not have been too difficult—but there were no such events.

Clearly there is a lesson to learn from Jay: If the rest of us knew how he works on the air, then we should be able to improve our operating skills, make better use of our gear and our time, and thereby increase the number of DX stations we work.

To get such inside information, I spent several hours with Jay in his shack. I watched him operate, studied his logs, drooled over his gear, asked him about techniques which might make me—make all of us—better operators. What I learned may well surprise you.

Go for the Gold

To fully appreciate what can be learned from Jay, we should start by looking at his achievement. His motivation was, of course, to earn the DXCC Golden Jubilee Award, an attractive certificate offered by the ARRL to all hams who worked 100 of the DXCC countries during 1987.

"My goal was to work 100 countries in 48 hours," Jay said. "Since the affair started late on a Thursday afternoon in California, I figured I had to have my paperwork in the mail on Saturday, so it could be delivered to the League headquarters in Connecticut on Monday. If it got there later than that, I'd probably not be among the first."

According to *The DX Bulletin*, Jay was first. In recognition of his skills, that publication presented him with a special trophy—a four-inch, gold-colored, metal figure in the shape of a number 1.

Jay is proud of that award, but he wonders. "A couple of other hams, maybe more, I've been told, may have done it faster. But apparently I was the first to do it and get the paperwork in."

According to the ARRL itself—which dated its certificates but did not number them, or note the length of time required to work 100 countries—four DXers were awarded the same day, January 5. They are AA2Z, Mark Wilson of East Hampton CT; K1MM,

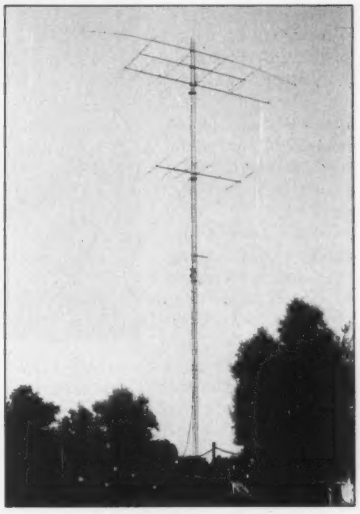


Photo B. Although taller than a 14-story building, W6GO's tower appears shorter because of the limitations of photography and the absence of other structures for comparison.

William Poellmmitz, Farmington MA; K6AAW, Larry Murdoch, Red Bluff CA; and Jay.

Of the 100 countries Jay contacted, 48 were worked by CW, 52 by phone. Forty-nine countries were worked on 20 meters, 32 on 40, 12 on 80, and 7 on 15. All told, he made 233 contacts.

"The best" of those contacts, Jay says, were BY (China), 9Q (Zaire), BV (Taiwan), C2 (Nauru), H4 (Solomon Island), 3D6 (Swaziland), ZD7 (St. Helena), and 3D2 (Fiji). That last one, Jay's log notes, was "8-9 Watts, Honda Accord parked."

Jay began his run for 100 countries at 0000 UTC January 1, and contacted 38 countries by the time the bands closed around 0900 UTC (2 AM local time). After about 5 hours of sleep, he was back at his rig at 1407 UTC (just after 7 AM local) and operated until 1036 UTC (3:36 the next morning); after that stretch of about 20.5 hours he'd contacted 87 countries. Then he took another 5 hours rest, returned to the air at 1554 UTC (just before 9 AM local) and at 0042 UTC (5:42 that afternoon), worked PA3DKU (Netherlands) to complete his 100 contacts.

In working those countries, he used a varied array of what might well be called tools. As we look at them, you might consider each as a checkpoint for possibilities to upgrade your own QSOing.

Photo C. W6GO points to his Golden Jubilee certificate dated on first day of the award.

The Tools

Tower: This is the most striking tool in Jay's DXing kit. The tower is 158 feet high. Viewing such a height from the ground, it is difficult to comprehend the loftiness of that tower. Nearby are several trees approximately 30 feet high, but they are far too short to make meaningful comparisons. As I looked upward from a short distance away from the tower, the linear loaded 80-meter dipole, mounted 153 feet up the tower, looked more like a toothpick than a 90-foot element.

But the tower is taller than a 14-story building; taller than the dome of the Untied States Capitol; taller than the Statue of Liberty.

At the 72-foot level of the tower there is a rotating joint; thus, the top 86 feet of the tower can be turned. The structure is mounted on a cubic meter of concrete. The four sets of guys—at 42, 72, 106, and 127 feet—are anchored in three cubic meters of concrete, set 130 feet from the base.

The tower and antennas were set in place by a helicopter in just a little more than three hours. "It took longer than that to edit our videotaped recording of the entire operation," says K6HHD, Jan O'Brien, Jay's wife and another prominent DXer.

The structure is located close to the center of a 10-acre spread. The coaxial cables from the antennas to the shack run just under 500 feet. "That's not really too much of a run," Jay says, "What little is lost is more than made up by what's gained from the height."

Antennas: In addition to the 80-meter dipole, the tower supports a 40-meter, four-element yagi at the 147 foot elevation; a 20-meter, six-element yagi at 140 feet; a KT34XA tribander at 106 feet; and a 160-meter half slopper, which is fed at the 75-foot level, just below the rotator.

Photo D. Jay holds the gold-coated "#1" trophy presented to him by The DX Bulletin attesting to his working 100 countries in 2 days, 42 minutes.

The Shack: Compared with whatever might be the typical ham shack, Jay's is a mansion—in size, equipment, furniture, and layout. The actual operating position is relatively modest: about an 8-foot custom-made table and shelves with white Formica-type tops, on which sits an impressive array of gear. But the station is less than ten percent of an entire...well, *arena* devoted to ham-related activities.

They take place throughout most of a double-sized living room, dining area, and two reception foyers. Spread out on tables which are along the walls of the rooms are three computers a dot-matrix printer, a laser printer, three daisy-wheel printers, a specially-designed printer for mailing labels, modems, and much more—with a maze of cables and switches so all can interconnect in any combination.

To work—or to contemplate—all this equipment, and to accommodate guests, there are enough luxurious sofas, stuffed chairs, recliners, and such (with a charming wood-stove set in the middle of the layout) to seemingly equip a modest furniture store. Clearly, the O'Briens enjoy combining hamming with living well.

Gear: To work the world, Jay uses two transceivers: ICOM's 751 and 730. Adjacent is an imposing mass of equipment: to select antennas and rotate the tower, to determine beam headings, to monitor signals—plus far more gear that I felt motivated to list or to question.

One of the key elements in Jay's successful operating is an amplifier, an Alpha 76PA, 1,500 Watts output. It's a key unit because of his interesting—offbeat—attitude toward using amplifiers. He says, "I know a lot of hams—maybe most hams—say amplifiers add to interference on the bands. I don't think that's true. If I operate 1,000 Watts, I'll usually make just one call and have my contact. If you operate at 100 Watts, you often have to call up to ten times to make your contact, and those extra calls produce more QRM."

Listening: Of course you've read and heard of the value of this basic tool in virtually every manual, handbook, tip-sheet, guide, course, forum, whatever, concerned with operating skills. But apparently Jay was born with–or has developed–especially alert and sensitive ears. During one animated discussion amongst him, his wife, and I, he heard a 2-meter call for his wife when neither she nor I had heard anything at all on the air. Later, when checking the bands to demonstrate his gear to me, he'd barely pause on a station, yet he'd hear the station's call completely, correctly, the first time it was given, even calls down around 2x2.

Calling CQ: "This is more effective than many hams realize," according to Jay, "If no one called, no one would make any contacts." He got most of his 100 countries by calling "CQ". He didn't have to call repeatedly; pile-ups would often develop quickly as

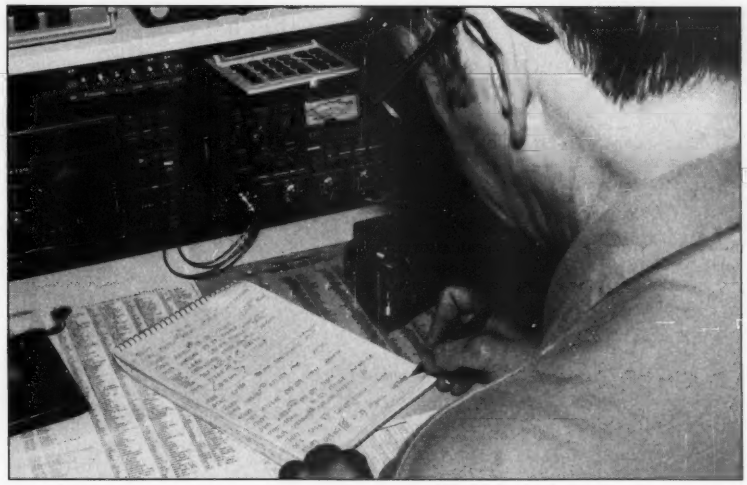


Photo E. Based on logs such as this, Jay sent some 5,000 QSL cards during the first half of 1987 alone.

his strong, clear signal attracted, at times, more stations than is ideal for quick and easy reading. Then he'd move off, sometimes changing both band and mode.

It's also wise to call CQ every now and then on a band that doesn't seem open—where there are no signals to be heard, or very few. Especially on 10 meters—that's opening more and more these days, and it's also open a lot more often than many hams realize; they just don't send out CQs to find out."

"his" and "my" signals reports, frequency, and name of the hams he works. For this chase of 100 countries, he entered an extra notation; a number in a circle to indicate how many countries he'd worked.

Watching Jay away from his operating position also reveals his efficiency. As soon as he cued up the 40-minute videotape of the raising of his tower, so I could view the event, he immediately moved to a computer to work without interruption until I'd finished

"I watched him operate, studied his logs, drooled over his gear."

Persistence with Flexibility: One application of this tool is Jay's staying on a frequency when it is productive—bringing in new countries—but moving at a timely moment to another frequency, even another mode.

His log shows that during the first morning he sent a CW "CQ" on 14,017.3, made 16 contacts, picked up five new countries (numbered 46 through 50) in 37 minutes. But during the last 15 minutes no new countries were worked, so he shifted to 15 meters phone and contacted 6 additional countries in the next hour. Later, in one 2-hour period on 20 meters, he worked 9 countries, but added only 2 new ones, so he shifted to 15 meters and in just over an hour-and-a-half made a run of 9 new countries (numbered 62 through 70) when new ones for his list were becoming scarce.

Efficiency: Watching Jay operate, you'll notice there's very little wasted motion, effort, or time. He logs in standard 6″x9″ secretary's shorthand notebooks, the ones with green pages and a spiral ring at the top. His entries are neat, easily readable, written in six columns, unlined yet straight as marching soldiers. He logs in this order: time, call,

viewing the tape. Then, as we walked outside to talk about his tower, he moved a couple of lawn sprinklers without breaking the story he was telling. When I drove away from our visit, I glanced back and saw that before I'd left his property he was already at watering another plot.

Another sign of his efficiency: he sends his QSLs to all DX stations soon after he works them, rather than waiting to receive cards from them. "I've found that saves me a lot of time and effort. By sending cards to everyone, when I get a stack of cards in the mail, I don't have to bother to look up in my log the details of the contact. Also, it helps satisfy the demand for California QSLs for those overseas DXers who are chasing the awards offered by the California DX clubs."

His QSLing is made easier by the *QSL Manager List* he and his wife publish monthly. It is a computerized listing of more than 5,000 QSL managers. Many hams consider it the most accurate source available on where to send your cards—you can get confirmations from DX stations considerably faster than by going through bureaus.

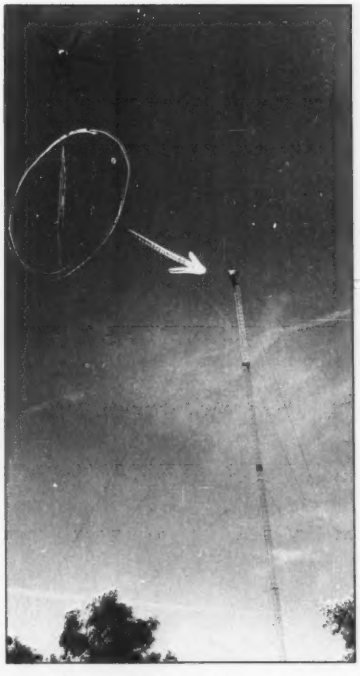
Experience: Jay began hamming in 1949. He has worked 320 countries, all confirmed except VU4 (Andaman and Nicobar Islands). He is on the DX Honor Roll at the 308 level. Above his gear is a display of 17 plaques, including 5-band WAZ and 5-band DXCC, 1983 DXer of the Year of the Northern California DX Club, and a variety of honors for his frequent entries in contests.

His related experience includes 30 years with Pacific Bell (Telephone), from which he retired a few years ago as a project manager. He continues to work occasionally as a consultant in the project management field, RFI, computer problems, and other communications-related fields.

Jay's experience has also helped to build his apparent concern for people. Despite his eagerness to work 100 stations as fast as he could, he still took time to log the names of his contacts. He also took time to note some interesting bits of information: "Just about to graduate from high school," "Near Paris," "Gold Coast city," "Boy Scout," and such.

An unknown wordsmith said, "The difference between men and boys is the price of their toys." Jay is one man with expensive toys—but he plays with them very well indeed. A great many hams can learn much–improve their DXing–by following his lead.

Leon Fletcher N6HYK lives at 274 Webster Drive in Ben Lomond CA 95005. He is a prolific author of books and articles as well as professor emeritus of speech at Monterey Peninsula College.



This tower, taller than the Statue of Liberty, required a helicopter to lift the top 21-foot section into place.

Brian D. Smith KA9OIH

Fostering Goodwill and Great DX

W87PAX operations at the Pan American Games.

In early August of '87, I embarked on a solo DXpedition to the land of the world's rarest prefix. Starting on the west side of Indianapolis, I spent a solid half-hour navigating my 1972 Pontiac across concrete trails that pierced the heart of the city. At length I wound my way to an eastside neighborhood, onto a short side street and into a grassy field, where I abandoned the vehicle; the rest of my journey would have to be covered on foot.

Alone and unarmed, I trudged through grass and gravel for what seemed like minutes until—there it was! Rising up in front of me was my destination—a five-room, white building surrounded by several lofty antennas.

Yes, it's true: For 23 days in August, this tiny spot in the middle of W9-land was, literally and figuratively, the home of the world's rarest prefix—also known as special-event station W87PAX.

This operation, with which I am proud to have been associated, began as an organized effort to commemorate the Tenth Pan American Games in Indianapolis. But by the end of its meteoric life, it had, in the opinion of many, blossomed into the most successful special-event operation of all time.

That's a bold statement, of course. But W87PAX racked up some pretty bold statistics.

> ***"I was in the Magic Kingdom of DX Disneyland."***

Operating almost nonstop from August 1 to 23, the station logged more than 23,000 QSOs in 139 countries. Our 44-member crew placed up to nine transmitters in simultaneous operation, used six modes (including ATV) and conducted QSOs on 13 frequency bands between 160 meters and 1296 MHz.

As a result, we are claiming nine all-time records for a special-event station.

But numbers alone don't tell the whole story. Our totals notwithstanding, we never intended to mount an operation based solely on the ledger sheet.

Naturally, we savored the ever-rising QSO count and the smorgasboard of scarce DX that, for once in our lives, was chasing us. But believe it or not, our bottom line was simply to have fun.

In the process, of course, we generated excitement in the world radio community, attracted national and international news coverage of ham radio and spread goodwill from the city of Indianapolis across the entire world.

There were other highlights, too. We received and delivered about 300 messages to and from Pan Am personnel. We helped arrange a third-party agreement between Washington, DC, and the island of Aruba. And above it all, we had the time of our lives on the airwaves.

So much for summaries. A story of this magnitude is properly told in sequence, so let us turn back the logbooks and return to the very origin of W87PAX...

Photo A. The main operating station at W87PAX, which amassed 13,632 QSOs on 20 meters.

The Way We Were

Our tale begins a few years ago in a continent far, far away. It helps to know that Santiago, Chile, originally owned the right to stage the 1987 Pan Am Games, a multisport event for athletes in the Western Hemisphere. But political unrest and a lack of funding prompted the Chileans to relinquish the Games in 1983.

Next in line was Ecuador, but in November 1984, that nation bowed out, too.

With time growing short, the Pan American Sports Organization (PASO) met in Mexico City to select a new host. Havana, Cuba, and Indianapolis were the only bidders; both came out winners. PASO awarded Indianapolis the 1987 Games and Havana 1991 Games.

Meanwhile, back in the Hoosier capital, ham radio operator Kurt Pauker, KT9M, heard the news and saw an opportunity. Pauker believed that the Games, which are second in scope only to the Olympics, deserved a special-event station of the same magnitude.

He wasted no time in buttonholing the local Pan Am Committee, PAX/I (Pan American X—Roman numeral for 10—Indianapolis).

"He said that we've just got to do a big station," recalls Mike Koss, W9SU, who furnished the shack for W87PAX. "He went to the committee and told them he had everything organized, that he'd gotten a bunch of guys and a station.

"Actually, he hadn't told anybody," says Koss. "But the Pan Am Committee said go ahead. So he called me, 'Guess what we're going to do? We're going to do it from your place,' he said."

The first step was to obtain an appropriate call. "The FCC would not authorize us a special license per se," says Koss, "but they were willing to consider modifying an existing callsign."

They search the *Callbook* for the right combination. Since the station would be in Indianapolis, their goal was to borrow a 9th Area callsign with PA in the suffix.

Surprisingly, the first couple of amateurs they contacted turned them down. Organizer Mike Head WB9ZQE then contacted W9PAX, Gordon Miller, an Advanced Class operator from Wisconsin Rapids, Wisconsin.

"We called him on the phone," says Koss, "He was quite enthusiastic about it. I think he was kind of honored."

With the W9PAX call in hand, they went for broke. Undoubtedly, a special, FCC-approved callsign would add zeros to the QSO total. But the Feds hadn't done that number since the 1984 Olympics.

Twice, the organizers petitioned the FCC for permission to modify the call to W87PAX. Twice the FCC said, no. "We still didn't want to give up on it," says Koss, "So we contacted them by telephone. After careful explantion and negotiation with commission officials, they were willing to make the exception."

The official word arrived in a telegram from Michael Fitch, chief of the FCC's Private Radio Bureau. Fitch noted that the approval of one petition "tends to result in a proliferation of such requests."

"However," he added, "due to the international nature of the Games, the participation of athletes from virtually the entire Western Hemisphere and the predicted large number of spectators, we believe that a waiver of the callsign requirements is in the public interest and therefore warranted."

Photo B. After their successful effort ended, many of the 44 operators of W87PAX assembled for this "team picture." Note the lofty antenna in the background.

Photo C. W87PAX operators Chuck Mitchell WB9NWF (at left), and Brian D. Smith KA9OIH (the author of this article), sit at the main operating station.

(A discouraging note to all special-event organizers who would follow in our footsteps: Don't count on it. Before you flood the FCC with similar requests, remember that the Pan Am Games involved 38 nations. The sad truth is that unless your event is also international in nature, chances of obtaining a special call are virtually nil.)

W87PAX organizers had publicized the operation in amateur radio magazines, but they took no chances. Just in case their efforts fell through, all notices mentioned both calls—W9PAX and W87PAX. Either way, the station would operate from 0001 UTC August 1 to 2359 UTC August 23.

W9PAX went on a couple of trial runs on Field Day and in late July. On the last day of July, less than eight hours before air time, Koss received the news we'd been waiting for: temporary permission to use W87PAX. Success was assured.

On the Air

When word of the special callsign arrived, "We immediately rushed to notify all the operators," Koss says. They correctly anticipated that all Hades would break loose once the first CQ from W87PAX crackled across the well-publicized frequencies.

Midnight tolled in Greenwich. "At that point, we had all six stations ready to go," says Koss. "Like the flying start at the Indianapolis 500, at 0001 UTC, Kurt yelled, 'Go!' and everybody jumped in."

It's a wonder the ether survived. "There was a pileup on every band, even on VHF,"

Koss notes. Eighty meters, 40, 20, 10, 6 and 2,...at every stop, stations were piled higher than the F layer.

WA2DTN nailed down the first QSO. Others rolled in like a tidal wave. "We worked 3,000 stations the first day, and 5,000 by the end of the weekend," Koss says, "There were 50 straight hours of pileups; we had over 100 QSOs an hour.

"It was like being DX without leaving home."

DX Dreams

For me, the dream is always the same. In reality I'm fast asleep, but in my imagination I'm sitting behind the microphone of my home station, frantically trying to direct traffic as the rarest DX on the planet chases KA9OIH.

"The BY1 station—I SAID, 'PLEASE STAND BY!' The 1S1, you're 5 and 9! Albania, you're next!" Then comes the inevitable buzz of my alarm clock.

But when my turn came at W87PAX's 20-meter mike, the alarm clock was silent. The dream was real.

My seventh QSO was a 3A2 who fought his way through my pileup. Later, in the span of 40 minutes, I worked a poker hand full of 5's—a 5H3, a 5L2, a 5N8, and 5V2 and a 5B4. There was a VK9, a 7X2, a ZB2...my head was reeling. I was in the Magic Kingdom of DX Disneyland.

This is the sort of experience that gives one incentive to lead a good life. Perhaps someday, when I become a silent key, St. Peter will show me the way to that great ham shack in the sky, where all the pileups are deep and all the sunspot counts are above average.

Higher and Higher

Despite generally disappointing conditions, our QSO total reached 10,000 after the first week and 17,000 after the second.

One of the secrets of our success was the certificates we dangled before the eyes and ears of our fellow hams. Work us once for a QSL card, we said, work us on three bands for a certificate.

That proved to be a stroke of genius. Instead of one QSO and goodbye, stations were trying for three. Some couldn't even stop at that point. "I've worked you on five bands now," one ham boasted. And so it went, as multiple QSOs with W87PAX became a status symbol.

"A lot of this has to do with understanding low-band mentality," says Koss, "These people like certificates, special callsigns, fancy QSL cards. That's the thing that drives them in the hobby. Offer them that and you can't lose."

Meanwhile, we accommodated—and even cultivated—the media's attention. We'd already found ourselves in USA Today and on local television, but why give up there?

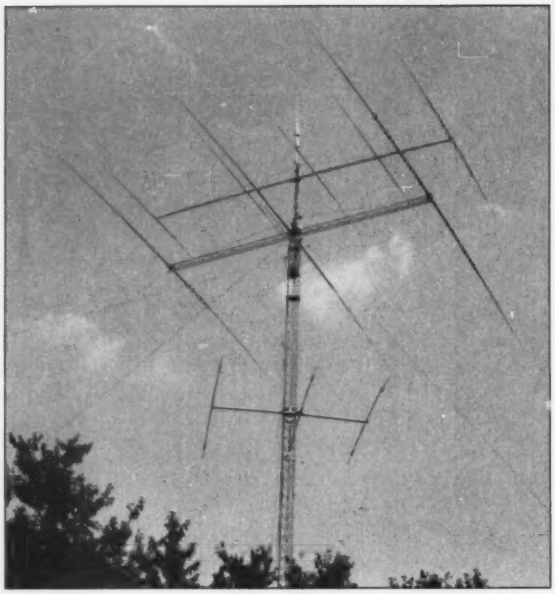


Photo D. One of the four towering antennas at the ham shack of Mike Koss W9SU, which was used for the W87PAX operation.

My eight years as a journalist had taught me how to, and how not to, write a news release that will catch an editor's attention. So I whipped up a punchy release that we photocopied and sent to the local media. That prompted even more coverage.

Meanwhile, back in the shack, spirits soared. We manned the station virtually around the clock, and as word spread of our operation, others wanted to enlist.

For example, after working our station, Ron Weiss W9OFF, asked if we needed any more operators. Sure, we said, come on down. Weiss and a friend, Chuck Mitchell WB9NWF, proved to be dedicated reinforcements.

Besides instigating pileups, we found time for public service. We learned that messages from our Pan Am visitors were not being delivered to their home countries (chiefly South and Central American nations) because of a snafu.

The existing traffic system, it seems, could not easily handle messages in Spanish. With our respectable array of antennas—four towers between 90 and 140 feet—we figured the shortest distance between two points was a straight line. So, without prior planning, we organized a daily Pan American net and encouraged check-ins from our ham radio brethren in South Central America. Their enthusiastic assistance enabled us to deliver dozens of messages in short order.

Once, we found ourselves dabbling in international relations. Officials from the island nation of Aruba had become ensnared in bureaucracy when they called Washington, DC, to negotiate a third-party traffic agreement for the Pan Am Games. The request filtered down to Aruba's amateurs, who heard our Pan Am commemorative station on the air and decided to give us a try. On behalf of Aruba, we contacted the FCC, which in turn forwarded Aruba's request to the State Department. A third-party agreement soon followed.

No mention of our special event would be complete without recalling how much confusion our unique callsign caused among the uninitiated. The best line came from the Novice who insisted we were mistaken about our call. "Check your license again," he told us. "It's probably W-B-7PAX."

SK for W87PAX

The swansong of W87PAX floated across the airwaves shortly before the unrelenting Latin beat of Miami Sound Machine enlivened the Games' closing ceremonies. Our temporary license was to expire at 2359 UTC August 23, so in our final hour we activated every station, staging a final burst of comet-like brilliance before disappearing forever into the haze.

In those waning moments, I found myself CQ-ing at the key of our 40-meter rig. Strangely, QSOs were scarce. At 2355, I answered the call AA4IO with a quick "599" and flashed a "QRZ?" But there was no response.

The Koss entered the room and told me to QRT. AA4IO returned with another question, asking my name, as I recall. "Brian," I replied, "SRI—MUST QRT. 73. AA4IO DE W87PAX SK."

Feeling depressed, I switched off the rig and stood up. Suddenly, the station sounded like a library. Fellow operators milled around, saying little. The atmosphere was subdued.

Koss had ordered enough Chinese food to feed the People's Army, so we formed a line and filled our paper plates with "BY" cuisine.

Sitting on the porch, we heard news of our whopping QSO count—23,270—and celebrated briefly. Then it was time to go. We clasped hands, exchanged congratulations and murmured our farewells.

Darkness engulfed me as I walked down the driveway toward the W87PAX parking lot. Headlights appeared behind me, and as I turned around, I heard the voice of Koss's non-ham neighbor. Even he had heard of W87PAX.

"Hey," he shouted through his rolled-down car window, "What are you guys gonna do next week?"

I chuckled and shook my head. "I don't know," I said, sighing, "I really don't know." 73

Brian Smith KA9OIH lives in Indianapolis IN 46260 (1742 Century Way/8) and is an editor with Indianapolis magazine and an avid DXer.

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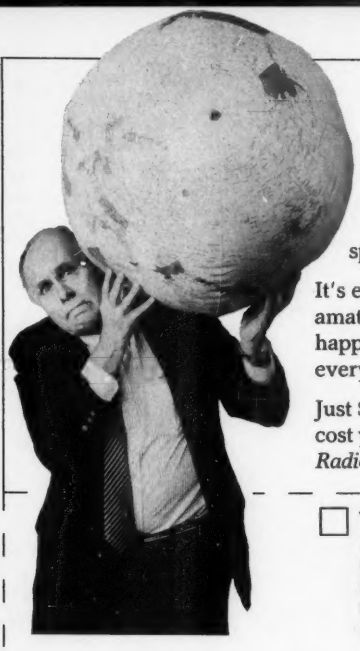

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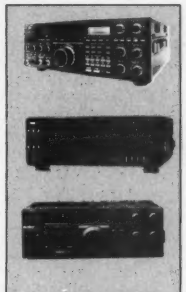
IC-38A	Compact 25w 220 mobile/DTMF	489.00	414.95
IC-48A	Compact 25w 440 mobile/DTMF	489.00	414.95
	all of these ICOM VHF/UHF rigs INCLUDE THE CTCSS (PL)!!!		
IC-271A	All mode 25w 2m xcvr	899.00	699.95
	CLEARANCE SALE—A FEW LEFT!		
IC-471A	All mode 70cm xcvr	1049.00	809.95
	PRICED TO CLEAR THEM OUT!		
IC-275A	Deluxe all mode 2m/pa/25w ICOM'S latest all mode!!!	1199.00	1034.95
IC-275H	NEW 100w 2m all mode w/pa The Grid Square Getter	1399.00	1199.95
IC-375	NEW 220 all mode/25w/pa Another first from ICOM!	TBA???	TBA???
IC-475A	NEW 70cm all mode/25w/pa	1399.00	1189.95
IC475H	NEW 100w 70cm all mode/pa The biggest gun for/UHF!	TBA???	TBA???
IC-900	NEW remote control multi-band FM xcvr. NEAT!!!	589.00	504.95
IC-2AT	1.5w 2m synthesized HT	299.00	254.95
	The IC-2AT has been in production longer than any other HT produced for the Ham market. Time tested, tried and true!!!		
IC-3AT	220 version of IC-2AT	339.00	289.95
IC-4AT	440 version of IC-2AT	339.00	289.95
IC-02AT	2m HT/10 mem/ctcss/DTMF	396.00	339.95
	5 watt version w/BP7		
	3 watt version w/BP3	369.00	314.95
IC-03AT	2.5w 220 HT/ctcss/DTMF Great for novice!!!	449.00	389.95
IC-04AT	3w 440HT/ctcss/DTMF	449.00	389.00
	Get away from the crowd—go 440!		
IC-u2AT	Micro 2m ht/ctcss/DTMF/mems	329.00	279.95
IC-u4AT	Mini 440 ht/ctcss/DTMF/mems	369.00	319.95
	Looking for a small ht with big features? Check out the ICOM MICRO line hts.		



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TS-430s	Compact gnrl cvrg xcvr DXciting price!!!	899.95	749.95
R-5000	102 dB range SW receiver 100 Memory Channels!!!	949.95	774.95
R-2000	General coverage receiver 10 memories/2 clocks	699.95	569.95
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TM-2550	45w 2m mobile/DTwF	489.95	414.95
TM-2570	70w 2m mobile/DTMF	589.95	499.95
TM-3530	25w 220 mobile/DTMF	479.95	404.95
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TH-21BT	Mini 2m xcvr/DTMF/ctcss	279.95	239.95
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TH-41BT	440 version 21BT	299.95	254.95
TH-205AT	2m 3w ht/3 memories Affordable HT!!!	279.95	234.95
TH-215AT	2m 3w ht/10 memories/ctcss	359.95	314.95

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TH-415AT	2.5w 440 ht/10 mems/ctcss	379.95	324.95
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TM-321A	220 version of 221	439.95	374.95
TM-421A	35w mobile 440 w/DTMF mic	439.95	374.95
TR-751A	2m all mode mobile	629.95	534.95
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FT-23R	Mini 2m HT/DTMF	299.95	259.95
FT-73R	Mini 440 HT/DTMF	314.95	279.95
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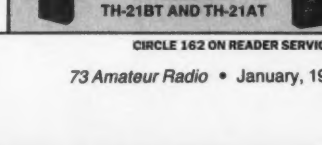

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CIRCLE 162 ON READER SERVICE CARD

NEVER SAY DIE

from page 6

terested in and send it in. Only about 10% of the *73* readers have been using the card . . . tsk . . . and that's illegal and punishable according to the contract on page 6. I've been far too lenient about this so far.

Your reader's service card with some circles will make our advertisers very hapy—will make me happy—and, if you actually buy some gear, will result in *73* growing in size back to a big, fat magazine. When's the last time you made people happy so easily?

One more thing—while some advertisers go to a lot of trouble to see that you get the information you want, complete with ordering information, we have a few who haven't got their act together. I'd really appreciate hearing from you on how quickly your responses arrive, how helpful they are—and if they got you to buy something. Your feedback will help me get advertisers to do better. One of the most fun things in amateur radio is buying something new and getting it on the air.

In the meanwhile, if you can think of any way I can make *73* more fun—yes, I know, cut the editorials—let me know.

Not for Profit

In a recent ARRL newsletter I read the following, "It is obvious from the comments filed that the amateur community views the assignment of call signs as a service, and not as a business proposition, and amateurs would not be supportive on the appointment of a for-profit entity as a Special Call Sign Coordinator (SCSC). The Amateur Radio Service has always been non-commercial by its very nature, and as such it would be improper in the extreme to commercialize the assignment of call signs. Amateurs are certainly willing to pay the cost of services received, but not to the extent that a private-sector entity appointed by the Commission should profit from it."

Since, out of the twelve entities who filed petitions with the FCC, there seems to be only one non-profit entity other than the ARRL seeking to provide a national SCSC service, the above comments would seem to be self- serving in the extreme. But let's take a look at the concept that's involved here.

Shortly before the American Constitution was written two hundred years ago Adam Smith published his *Wealth of Nations*. This book makes as good reading today as it did two hundred years ago. It's a manifesto for the entrepreneurial-capitalistic system —you know, the one the communists call decadent.

Having visited the USSR, China, Czechoslovakia and Yugoslavia, I can personally affirm what you've read—communism does not work—it has not worked for the benefit of the people in one single country. And that's the main difference between for-profit and non-profit. It's communism/socialism vs. capitalism. Has Karl Marx or Adam Smith triumphed in the test of time?

Let's look at non-profit as we have it in America. Well, we have our government, which certainly is a model of non-profit . . . we've the highest international debt in the world. I challenge you to point to one single government program which is run with any efficiency.

And we have our non-profit American educational system which is infamous for its protection of poor teachers and its resistance to change. It's also famous for turning out illiterates and bozos.

Non-profit corporations enjoy massive postal benefits, paid for by the for-profit corporations with which they compete. Non-profits have little restraint on lavish salaries and perks—and apparently no limit on the millions they can salt away in investments. We've all read about the millions siphoned from non-profit groups into mob enterprises.

The real strength of America has always been in capitalism . . . and its main weakness has been socialistic adventures. Yes, they're always well-meaning—that's the apology for these unending failures.

If we get a non-profit SCSC group to issue our calls it seems unlikely that we're going to see the first known efficient non-profit organization. What we'll see is what we always see when we deal with bureaucrats—inefficiency, bungling, arrogance and frustration for us. The few intelligent people I've met working for our government or non-profit corporations are hopelessly trapped by systems which defeat their intelligence. Few people with intelligence or creativity last long in these maddening situations. They soon discover they'll never make much money, they'll never be able to make decisions without the fear of damaging their careers—that creativity is a cardinal sin. So this is what amateurs are demanding to run the SCSC service?

I wish every amateur who honestly believes that he is going to get a better and cheaper service with a non-profit than with a for-profit group running the SCSC program would visit the USSR—anywhere in the USSR! The total lack of interest in work which guaranteed employment engenders has to be seen at first hand to be really understood. We see it here at times when we have to deal with the government.

Have you forgotten your brush with our Employment Security Administration? Car registration? The military? Let's be kind and say that our bureaucrats are not as helpful as we might like. One gets the impression that government employment too often attracts tiny minds intent on doing the least amount of work necessary to achieve retirement.

Sure, there are exceptions, many of whom I know personally. But when I talk with the exceptions their stories of frustrations with the system in which they are trapped are sad to hear.

I'd far rather buy my call signs from a for-profit company which has to provide good, efficient and inexpensive service in order to keep its franchise.

Lordy, The Connecticut Turnpike was able to get rid of four toll booths (35c each) just by giving the food franchise at the rest stops to McDonald's. The result is incredibly better food than we had before, better service, a saving of $1.40 tolls and no more pileups of traffic at the toll booths. Everybody won. This came to mind because I happen to be writing this as I drive along the Turnpike on my way back to New Hampshire from a most interesting adventure in New York City.

I want a for-profit company which is going to have a vested interest in providing good service—one which will be installing the latest in computers and communications, not bureaucratic forms and lifetime tenure employees.

I suggest that any amateurs who have written to the FCC or the ARRL (if any really did) pushing for a non-profit handling of call signs give the concept some serious re-thinking. 73

NEW!

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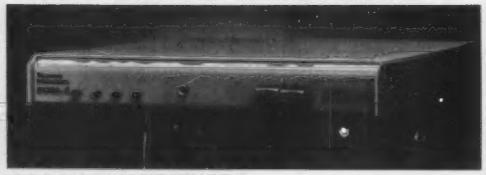

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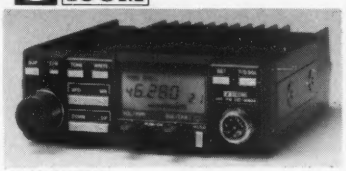

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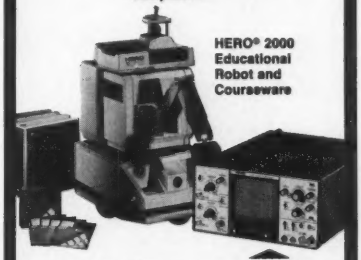

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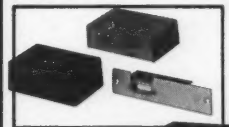

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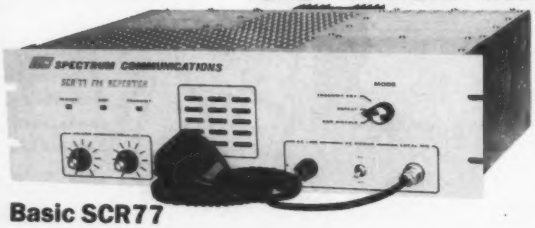

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CIRCLE 51 ON READER SERVICE CARD

73 Review

by Pete Putman KT2B

ICOM America, Inc.
2380 116th Ave. NE
Bellevue WA 98004
Price Classes: IC-475A $1400
AG-35S $95

ICOM IC–475A 70cm Multimode Transceiver/ ICOM AG–35S Mast-Mounted 70cm Preamplifier

Photo A. Front view of the ICOM IC 475A, 70cm Multimode Transceiver.

Hard on the heels of the "new-look" IC-275A 2meter multimode comes ICOM's offering for the 70cm band, the IC-475A. Regular readers will recall the review of the 275A in the March 1987 issue. In it I commended ICOM for their innovative design as well as the outstanding performance of the receiver front-end and mixer stages. The IC-475A lives up to the reputation set by the 275A.

Overview

Let's take a look at some of the unique features of the evolving "'75" line! First of all is the compact design with amber LCD display, resulting in a snappy-looking rig that fits into some pretty tight places. The case dimensions check out at 9.5″ W x 3.7″ H x 9.4″ D (same as the IC-275A) allowing either mobile or base-station installation. The heat sink is mostly internal to the chassis, and in fact upon opening the top cover, that and a small speaker is all you see. Incidentally, all "75"-series radios come with a built-in AC supply as well as external connections for 13.8 VDC.

The front-panel controls have been engineered for easy access, with the more important ones featured prominently to the left and right of the display. Adjustments that don't require frequent adjustment are found under the left-side push-button panel and are push-actuated potentiometers. These control RF POWER, RF GAIN, CW DELAY, AF TONE, and MIC GAIN. Additional buttons here control the optional speech synthesizer, T/R switching, and meter display. Directly above these are the main controls for mode (FM, CW, SSB), speech compressor, AGC time constant, and noise blanker. Tone-squelch settings are activated from this pad, as are the repeater offsets and a repeater-reverse control.

The volume, squelch and power controls are to the right of this pad, while switches for tuning speed, MHz stepping, VFO selection and VFO splitting are to the right of the main dial. Beyond this are located the RIT controls, memory-command buttons, memory-selection switch, and passband tuning/notch adjustments. The control complement is rounded out with 3 pushbuttons immediately to the left of the tuning dial for scan mode, and a data switch, which I'll discuss momentarily.

The amber display is easy on the eyes and it reveals a lot of information as well. Not only is the frequency displayed on both transmit and receive, but the RIT control and its offset are shown as well as the offset (if any), VFO or memory position, and the mode selected. The equally visible meter to the left shows power output, ALC level, signal strength, and acts as a discriminator meter in FM mode.

Right away you might ask why anybody might need a notch filter and passband tuning on 70cm, as these controls would only be used working CW or SSB. Well, they do come in handy on occasion during a contest or when the band is open during strong tropo—otherwise, you probably won't need them. ICOM continues their practice of deleting a

VOX function from their multimodes and I say more power to them! The only thing approximating VOX here is the adjustable CW-keying hang-time, which offers both semi- and full break-in. (The benefit of full break-in CW here is questionable, as most serious 70cm CW types will run outboard amplifiers and none of the various brands I know of are presently equipped for QSK operation.)

Half of a Pair

Since most of the control functions were discussed in the March IC-275A review, I'll cover them very briefly here. Two VFOs are standard, as is a 99-channel memory bank. You may store information regarding the mode, frequency, offset, and any tone squelch settings in these channels. Uploading this information to either VFO is accomplished at the touch of a button. You'll need to do that to use the RIT control, among other things. Loading memories is just as simple! In addition, ICOM provides a Call Channel (read Priority Channel) and two channels designated P1 and P2. These latter

"CW operation? It's a breeze."

channels define the upper and lower limits of a pre-programmed band segment scan mode.

What is the actual frequency coverage? Unlike the IC-275A which allows the user to listen in from 138–174 MHz, the IC-475A is limited to 430–450 MHz. That's it! This covers the current active 70cm spectrum in the US and Canada at present, and all possible modes are available—except Fast Scan ATV. This is unfortunate, since the companion IC-1271A for 23cm does offer FSATV, and it would make the transceiver more attractive to a larger market. Incidentally, one can run SSTV through the microphone jack, and ICOM also encourages AFSK RTTY operation.

The packet enthusiasts have been accommodated with the DATA switch I mentioned earlier. ICOM boasts of their high-speed switching time (less than 5 milliseconds) allowing both high-speed packet and full break-in CW. Select the DATA switch when running either packet or AMTOR modes to allow for that fast T/R switch time (no, it's not the default setting). You can use it in USB, LSB or FM mode. Apparently, packet on 70cm is quite popular over in Japan (in fact, packet on any band is popular there), so all of the '75-series radios have or will have this DATA switch and offer the 5ms keying time.

One last feature: There is a provision for a narrow CW filter as on the IC-275A, although it's not the same filter according to an errata sheet in the owner's manual. The correct filter is the FL-32A with a center frequency of 9.0106 MHz. This filter is a 500-Hz type with −6-dB skirts at ±250 Hz and −60-dB skirts at ±670 Hz. The band isn't that crowded during a contest on CW, but the EME operators will have lots of fun with this option, especially in conjunction with the notch and passband-tuning controls to home in on that weak echo.

Incidentally, ICOM has changed their amplifier keying contacts from the familiar RCA jack to an 8-pin DIN receptacle on the '75-series radios. It was a simple matter to make up an RCA-to-DIN jumper for the outboard amplifiers, once the proper DIN plug was located! This type of plug has tapered pins—not rounded, as most over-the-counter types sold in the US will have. If you try to force one of the latter types in, you'll do serious damage to the jack! Make sure you have the right plug. (It's the same plug used on the Kenwood TS-430/-830/-930 radios, by the way.)

In Operation

The receiver and preamp got a true field test. I took the IC-475A and the AG-35S to Chincoteague Island in June 1987 for the ARRL June VHF QSO Party. What better way to test it? The good news (and all the news is good) is that the transceiver worked better than I hoped!

This is the first contest in a long time that I've operated on 70cm without using a transverter and HF radio. Based on my experiences with the IC-275A (which was also undergoing a similar crunch test across the operating table), I felt that the 475A would pull its weight. The fact that we used two 21-element yagis ahead of it certainly didn't hurt matters.

Before I go further, I'll digress for a moment to the AG-35S. This was sold as a companion unit to the now-discontinued IC-471A/H series radios, but still uses the same DC-power switching scheme with the newer IC-475A. It uses a 3SK121 device in a waterproof housing and is rated at 100 Watts through-power capacity. I elected to use a Tokyo Hy-Power 70cm amplifier with built-in preamp after the IC-475A, but the AG-35S was put in the line between the transceiver and amplifier for comparison purposes. With a run of under 70 feet of Belden 9913 cable to the antennas, mast-mounting the amp was unnecessary.

ICOM rates the preamplifier at better than 15-dB gain with a noise figure under 1.5 dB. On-site observations were pretty much in agreement with that number. I wasn't in a position to measure the noise figure.

I can tell you with confidence, however, that the housing is indeed waterproof. The night before the equipment was completely installed, we were treated to one of the delightful Chincoteague thunderstorms, during the course of which one of the two support tents was partially flooded. In one corner of that tent lay the box in which the AG-35S and AG-1200S for 23cm were stored (of course), and they were discovered the next morning, merrily floating around in circles. Upon opening each unit, the internal housings were found to be bone dry. Satisfied?

Contest Contender

The September issue *73 Magazine* covers the contest. 432 MHz SSB and CW were fairly busy at times, and the IC-475A performed nobly, especially on weak-signal work. The IC-475A signal-strength meter suffers from the same malady as the one on the IC-275A: It's very sluggish. In separate tests on the bench, a 2–3-μV signal was required to register S-9. It moved hardly at all on most received signals (except when the

"The receiver is very quiet, a direct result of an efficient mixer and a well-designed front end."

external preamp was kicked in). The preamp made it possible to work grid squares over 300 miles distant with our modest station.

Received audio reports were acceptable and on a par with the IC-275A. Both transceivers offer crisp, punchy audio with the supplied hand-held microphone. (I didn't use any base-station microphones; rather, I used a foot switch to key the transceivers and the free hand to log and tune.) ICOM offers a speech-compressor option on the 475A, which helped considerably during contacts with very distant stations, providing the settings were correct. I suggest running the microphone gain at about 9 o'clock with the compressor ON for the best results.

CW operation? It's a breeze except, as stated earlier, most accessory amplifiers can't use the QSK option. You'll have to choose the appropriate drop-out delay with the front panel recessed control, and select the SEMI option on the back panel. Or, do as we did and opt for no delay time, using footswitches and the PTT line for keying.

One really handy feature on 432 is the RIT control, which offers up to 9.9 kHz of shift using a continuously-variable control. Despite all of the advances in phase-lock loops and high-stability crystal oscil-

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SPECIFICATIONS

Model	Freq. MHz	Power Input	Power Output	Preamp NF-dB	Preamp Gain-dB	DC +Vdc	Power A	RF Conn.
0508G	50-54	1	170	.6	15	13.6	28	UHF
0510G	50-54	10	170	.6	15	13.6	25	UHF
NEW! 1409G	144-148	2	160	.6	15	13.6	25	UHF
1410G	144-148	10	160	.6	15	13.6	25	UHF
1412G	144-148	30	160	.6	15	13.6	20	UHF
2210G	220-225	10	130	.7	12	13.6	21	UHF
2212G	220-225	30	130	.7	12	13.6	16	UHF
4410G	420-450	10	100	1.1	12	13.6	19	N
4412G	420-450	30	100	1.1	12	13.6	19	N

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lators, there are still an awful lot of signals on 70cm that slowly drift up or down from the initial contact frequency. During short contacts, you'd never notice it, but on repeated calls with some really weak signals, it is quite apparent. When finished, the RIT is disengaged by depressing the RIT CLEAR control, or by switching out of RIT mode altogether.

Survival of the Fittest

As an aside, the transceiver also survived, and is still doing well, after 3 successive nights of spectacular lightning displays, including a near-hit that blew up a nearby mobile amplifier and preamp. I should add that disconnecting the coax is highly recommended during such a storm! We did operate during some of the nearby (5–10-mile distant) thunderstorm activity with no adverse results. Finally, some overloading problems on the 475A were observed with the AG-35S preamplifier switched in while running 200 Watts on two-meters. We attributed this to the close proximity (within 7 feet) of the 70cm and 2m antennas.

Subsequent use during the CQ WW VHF WPX in July confirmed most of my observations from June. Many operators complained that the IC-475A had little or no front-end sensitivity, attributing the "quiet" front-end and mixer noise to a sub-par GaAsFET device. Well, the receiver is very quiet, a direct result of that same efficient mixer and a well-designed front end. If you are used to a loud "hisssss" when you turn on your 70cm station, this will throw you for a loop at first! Don't let it fool you: The 475A has an excellent receiver. See for yourself with the bench tests shown in the sidebar.

Conclusions

All in all, the IC-475A lives up to the promise of its 2m cousin and offers excellent performance across the 70cm band. Hook it up to a good solid-state amplifier or a more powerful grounded-grid setup and you'll have a 70cm station anyone would be proud of! As a bonus, the AG-35S is no slouch and its design allows for excellent intermod performance vs. overall gain. The two make a hot setup for 432 weak-signal work, whether it be EME, tropo, or satellite work. The cost will bite more than you might expect at $1400, but I don't think this will seriously deter 70cm operators.

The bulk of my testing of the IC-475A was in the weak signal modes, since I do very little FM operation on 70cm. I feel this test is sufficient because, in the past, it hasn't been difficult to find multimodes that work well on FM, but are compromised on weak-signal performance. ICOM put an end to that trend with the IC-275A and IC-475A radios. If you are inclined to take the plunge in a big way on 70cm with a do-it-all station, the IC-475A is an excellent choice. 73

Performance Data:

ICOM IC-475A 70cm Multimode Transceiver

and

ICOM AG-35S 70cm Preamplifier

Specification	Claimed	Measured
Receiver Sensitivity		
SSB/CW 10-dB S/N	.1 μV	.12 μV
FM 12-dB SINAD	.18 μV	.15 μV
20-dB Quieting	.25 μV	.3 μV
Minimum Discernable Signal (dBm)	n/a	–135 dBm
1-dB Compression (RF and 1st-mixer stage)	n/a	+4 dB output
Total Conversion gain (RF and 1st-mixer stage)	n/a	18.5 dB
Squelch Sensitivity (FM, SSB)	.14 μV .56 μV	.13 μV .4 μV
Selectivity (FM)	15.0 kHz/6 dB 30.0 kHz/60 dB	15.0 kHz/6 dB 25.0 kHz/60 dB
Selectivity (SSB, CW)	2.3 kHz/6 dB 4.0 kHz/60 dB	2.5 kHz/6 dB 4.0 kHz/60 dB
RF Power output (FM, CW)		
430–449.000 MHz	25 HI/2.5 LO	30 HI/2.5 LO
AG-35S Preamplifier gain		
430–450 MHz	15 dB	12 dB
AG-35S Preamplifier		
1-dB Compression	n/a	+6-dB output

All measurements made with Bird 43 Wattmeter, 10- and 50-D slugs, HP-608F signal generator, precision attenuators, and Boonton 92 RF millivoltmeter.

The receiver specifications are on a par with the IC-275A, which had a very good compression point. ICOM is finally getting the right stuff from their GaAsFET designs!

The IC-475A uses a quadruple-conversion scheme for SSB or CW work, with the first IF at 70 MHz, second at 9.0 MHz, third at 455 kHz and a fourth also at 9.0 MHz. FM uses a triple conversion set-up. The 1-dB compression point is not quite has high as I measured on the IC-275A, but is still excellent and as good as any standard transverter or receive converter.

73 Review

by Jerry Mangas N8EFG

The Heil BM-10 Boomset

A bit of magic from Sound Wizard Heil

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Price class: $75

I went to the 1987 Dayton Hamvention, as many of us do, with an eye on both new equipment and bargain second-hand gear. A boom mike was on my list, and knowing that Heil would be there, I was determined to fight the crowd and check their product. Conditions were so crowded and chaotic on Friday, I waited until Saturday to get to the Heil exhibit. There were ongoing demonstrations there of both the Heil boomset mikes and the Heil speaker.

The boom mike demonstration set-up allowed you to listen to your own audio over another Heil product. I could check the audio output of both the HC-4 and the HC-5 microphone elements mounted in the boom mikes, and I liked the sound of both. The salesman assured me that the HC-5 would drive the ICOM rigs as stand-alone units (normally pre-amplified microphones are needed in the ICOM set-up). I asked that question repeatedly, in different ways, to be sure that we both understood each other and they repeatedly reassured me there wouldn't be any problems.

The boom mike with headset or "boomset" as Heil calls it, is a fly-weight unit, with blue-foam-covered 32Ω earpieces, an adjustable headband, and a microphone that is both adjustable in extension and rotation. The fidelity of the earphones is not extreme, but more than sufficient for the limited 3-kHz bandpass of most of our modern rigs. The audio line and the earphone line are separate units. The lines are at least 100″ long each, which seems absurd, until you forget that you are wearing the unit (it is that light) and lean back from your operating position, or try to turn around to the computer. You can get a long way away before the boomset is rudely jerked off your cranium.

The earphone line terminates with a standard stereo ¼-inch plug, and the microphone terminates with either a standard ¼-inch phone plug or, for 10 dollars more, an 8-pin plug to fit your newer rig. There may have been other types, but I didn't see them. I purchased the HC-5 (full-range) element with the standard ¼″ plug set-up and later purchased an 8-pin plug to adapt to my ICOM 730. A friend, N8BNE, bought the HC-4 set to drive his Kenwood 430 and, coincidentally, my next-door neighbor, K8MDU, purchased an HC-5 set for his ICOM 735.

Photo A. The Heil BM-10 boomset.

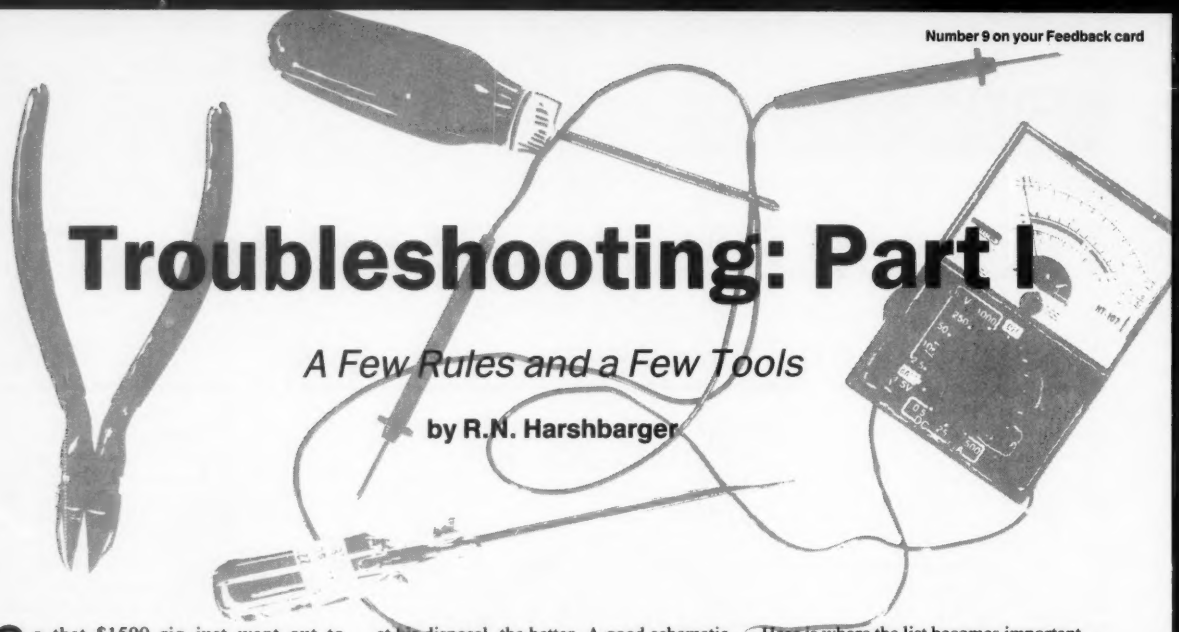
The proof of any purchase is in the operation, and these sets were put into use almost as soon as we groaned out of Dayton in our respective cars. The first change I had to make was to install a small blocking capacitor (.01μF) in the audio hot lead (the ICOM audio lead carries a DC voltage to power their pre-amp. The sets supplied with the eight-pin plug for the ICOM rigs include this capacitor).

The next thing that I discovered was that the HC-5 drives the ICOM with difficulty. I had to turn the microphone gain up to the full-output position to get any output from the rig. I tried various capacitors, but all they did was change the audio passband. A check on the air with N8BNE showed that his HC-4 into the Kenwood 430 operated just as promised, with the expected "Heil" quality audio (peaked at the 2200-Hz level). The audio reports I received on my HC-5 were mainly "nice audio, but very low level". Audio was good, or described as punchy, but "low." In other words, it does not really drive the ICOM 730, or the 735 directly, or at least not in the normal manner, with the mike gain ⅛ to ¼ open, nor with the gain wide open. K8MDU reported even less drive on his 735. Using my set on his rig showed the same effect, and vice versa.

The answer for me was to hook my HC-5 up to a small pre-amp, cobbled together from an "International Radio" schematic, which took care of all the drive problems and results in high output with excellent audio reports from the DX stations. When given a choice of a studio-grade microphone (a Shure 585SA or an ElectroVoice 634A) or the HC-5, most stateside stations preferred the studio grade, and the foreign stations without fail like the Heil over anything else that I tried. The state-siders that preferred the Heil over the more "bassy" studio mikes were for the most part DXers and liked their audio "punchy."

If you are looking for a very comfortable headset/microphone set-up; one that allows you to be aware of the rest of the household while you fight the pile-up using VOX operation; or if you want to work hands-free mobile using a VOX arrangement, and like the punchy effect of the various Heil elements, this is the set-up for you. Be sure, however, that you have a rig that doesn't demand a pre-amplified microphone. A push-to-talk switch could be easily wired into any of the 8-pin or 4-pin plugs if desired, or if VOX were not available on a particular rig. If you run ICOM gear, an external pre-amp or one of the various "equalizers" to properly drive your equipment may be required. 73

Jerry Mangas N8EFG lives at 5888 Rickfield North, Jackson MI 49201.



Troubleshooting: Part I

A Few Rules and a Few Tools

by R.N. Harshbarger

So that $1500 rig just went out to lunch or maybe that $2000 personal computer won't even acknowledge the power switch. If you've saved the original shipping carton, you're all set. You'll need to know the address of the "local" service center, maybe get a copy of the sales slip, and, oh yes, write for an RMA (Returned Material Authorization). Allowing for two-weeks transit time each way, and two weeks to get the RMA, you'll have eight weeks to study up for the Extra-class exam. On the other hand, you are a licensed ham, you know how to read a schematic, you understand the basic principles of electronics (hint: Ohm's Law), and eight weeks without a rig might cost you your marriage. Armed with a few rules and a few tools, you can very likely repair the rig and study for the Extra exam at the same time.

A FEW RULES

Safety First:

This well-worn slogan has to be the number-one rule here. A sincere respect for the hazards present in any piece of electronic equipment is the best safeguard available for a troubleshooter. The safety devices built into a piece of equipment can't be relied upon by the troubleshooter since he must remove guards and by-pass interlocks if the circuit is to be probed while energized. Follow this oft-used piece of advice when probing a live circuit: Keep one hand in your pocket and both eyes on the other hand. A clean, uncluttered work area with plenty of light and a pair of safety glasses are essential to safe troubleshooting.

Know the Circuit:

While the troubleshooter doesn't need the same level of understanding that the designer had, he must know what voltages to expect, and be able to follow the logical signal path. The more information the troubleshooter has at his disposal, the better. A good schematic diagram is a must. If your copy doesn't have such details as pin numbers, voltage levels, and a clearly marked signal path, then take a few hours to research these details and fill in the gaps. If you don't have a copy, then a note or phone call to the manufacturer is in order. The official service manual for your rig will probably cost less than the freight to send it in for repair.

Know the Problem:

Someone once wrote that if a problem is correctly stated, the answer is self-evident. Start with a paper and pencil, and list everything you know about the problem. List everything that works, and everything that doesn't. Be specific. List the positions of all the switches both when the problem exists and when it doesn't. Trust nothing to memory. State the problem in your own words and write everything down without regard to grammar or spelling. The organizational processes that your brain uses when you write will sometimes give you a whole new insight into the problem. All this pre-probe paperwork may initially seem unnecessary, but, by using this system, many a defective component has been singled out before the cabinet was removed.

Divide and Conquer:

A multi-page fold-out schematic is a little like a large metropolitan road map. When you first examine it, you may be overwhelmed, but on closer examination, it reveals many smaller neighborhoods, each with its own identity, and each making its own contribution to the large metropolis.

On an electronic schematic, you'll find neighborhoods with names like Power Supply, Oscillator, RF Amplifier, and Digital Readout. Looking at this transmitter as a whole may be daunting, but taken individually, they are much easier to understand, and much easier to troubleshoot. Here is where the list becomes important.

Use the list of things that work to eliminate the neighborhoods that work. Apply a little logic to eliminate some questionable neighborhoods. For example, if the digital readout works and it uses the +5-volt and +12-volt power supplies, then it's a safe bet that the +5-volt and the +12-volt power supplies work properly. After the defective neighborhood has been isolated, use the same technique to isolate the area of the neighborhood that's in trouble; and again isolate the specific active device not working; and again find the support element, such as a resistor, that is the problem. Each successive application of the divide-and-conquer system eliminates at least half of the remaining circuit until there is only one component remaining.

A FEW TOOLS

It would be easy to spend more money on the workbench than on the rig. Yet, in practice, there is only a handful of tools and equipment that you really need to troubleshoot and repair just about any piece of electronic equipment. A 14-hp garden tractor is nice if you're going to run a truck farm, but you can raise a very nice garden with a hoe, a rake, and a spade. When a piece of high-powered test equipment is absolutely necessary, it can be rented for a small fraction of the purchase price. In many towns, the high school shop is well-equipped and available, since the instructors are often hams.

A Good Meter:

One capable of measuring AC volts, DC volts, ohms, and AC/DC current is essential. It can be an older VTVM (Vacuum-Tube Voltmeter) or the newer transistorized VOM (Volt Ohmmeter). The cost will vary between $50 and $300 for a new unit, but a good used VTVM can be found at a local hamfest for as little as $25. Figure 1 is a list of the minimum requirements for the test bench meter.

Soldering Tools:

A good 25–40W soldering iron, a tip-cleaning sponge, and a stand will prove useful since few if any of the components are in sockets in the new rigs. You will also need a supply of rosin-core solder and some desoldering braid. A handful of alligator clips and a commercial typewriter eraser with a brush on one end are good soldering aids.

If you are a little rusty on your soldering technique, read up on the subject in the construction-practice section of one of the radio handbooks. To do it right, consider buying one of the self-teaching soldering courses available for less than $20.

Hand Tools:

These are another necessity, but you need not take out another second mortgage on the house if you shop around and stick to the essentials. Figure 2 lists the recommended hand tools. Don't skimp too much on the quality, because good hand tools will last a lifetime.

Miscellaneous Items:

Test clips in several colors, a tube of instant glue, a small magnet on a string, and a few baby food jars for hardware will come in handy.

THAT'S IT!

A few rules and a few tools. You are all set to take on just about any piece of ailing gear in the shack. What about things like oscilloscopes, signal generators, signal tracers, and digital frequency counters? These are valuable pieces of test gear, essential to the fully-equipped professional repair shop, where time is money, and the competition demands that the repair costs be kept down. When you determine that a high-priced piece of test equipment is needed, you can contact the local high school or the local technical school electronics instructor. If he doesn't have the equipment, he can probably introduce you to someone who does. Keep in mind, however, that most problems can be fixed without the expensive gear. 73

Originally from Pennsylvania, the author is an engineer for 3M in Minnesota. An avid runner and computer enthusiast, he lives at 3865 Granada Lane, Oakdale MN 55109, with his wife and three children.

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DC Volts	Lowest range should resolve 10 millivolts, highest range should measure 2000 volts.
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Current AC/DC	Lowest range should resolve .1 milliamp, highest range should measure 2 amps.
Input Impedance	10 Megohms
Accuracy	±3% of reading.
Power Source	Internal battery or isolated AC line.

Table 1.

Minimum Tool Box Requirements

Essential	Cost
5¼" Long nose pliers	$4 to $6
4½" Diagonal cutters	$4 to $6
Wire Stripper (#12 to #24 wire)	$3 to $5
¼" Nut driver	$2 to $3
#1 Phillips screwdriver (3")	Less than $2
#3 Phillips screwdriver (6")	Less than $2
⅛" Blade screwdriver (4")	Less than $2
¼" Blade screwdriver (8")	Less than $2
Allen hex key set	$8 to $10

Essential	Cost
Plastic alignment tool set	Less than $3
Razor knife	Less than $2
Optional	
Vacuum desoldering tool	$5 to $8
Nut driver set (8 pcs)	$8 to $12
Electrician's knife	$2 to $5
Mirror on an 8" handle	$4 to $6

Table 2.

73 SPECIAL PROFILE

LLOYD AND IRIS COLVIN DXERS' DXERS

by Leon Fletcher N6HYK

superlative: the highest or utmost degree; the acme; surpassing all others.

In the world of hamming, superlative is certainly the word for the Colvins—Lloyd W6KG and Iris W6QL of Richmond, California. Together they have accrued more than a century of hamming. Lloyd was licensed in 1929 (59 years ago) and Iris was licensed in 1945 (43 years ago). Those 102 years of amateur radio operating have produced records—*many records*. Some will stand forever. Now, we can all improve our on-the-air skills with the essential tips this unique couple has shared with us.

The Colvins have devoted their lives to travelling the world on DXpeditions. They have operated from nations so exotic that they are not even mentioned in many geography books. They have been honored worldwide—by ham organizations, of course, and by foreign governments as well.

Drawing from their extensive hamming experience, the Colvins point to a few basic but essential tips—tips that every amateur radio operator should know to improve on-the-air skills. But to fully appreciate their suggestions, it is helpful to begin by knowing a bit about this distinctive couple.

Photo a. The Colvins—Iris (W6QL) and Lloyd (W6KG)—in their home shack in Richmond, California. (Photo by Leon Fletcher, N6HYK.)

Colvin Real Estate

"It all started in the wilderness of Alaska," Lloyd enjoys saying. There, shortly before World War II, he bought 40 acres of land a short distance outside of Anchorage. "I paid $1,000 for the property, and I had to borrow most of that."

It was land on which Lloyd planned to build a giant rhombic antenna. He started construction, but had erected only one tower when some officials in the Army Signal Corps decided that Lloyd's spread was the very place the military needed for its own radio station. "So I sold them the property for $40,000—a profit of 40 times in about a year. And no income tax!"

That experience launched Lloyd on a career of buying and selling property. To do that, it was obviously necessary to know exactly where particular plots of land were situated—to have properties surveyed. "But in those days there were very few surveyors in Alaska," Lloyd says. "Earlier, while studying for my degree in electrical engineering at the University of California at Berkeley, I had taken one course in surveying. That was enough for me to get a surveyor's license in Alaska."

Soon he branched out, got a contractor's license, and was building homes, offices, and industrial structures in Alaska and, later, in California. Along the way, his wife Iris also obtained a contractor's license and worked closely with Lloyd as the projects increased in number, size, and complexity.

Together they continued to build their resources—until 1965: "That year we sold our house, closed out the construction contracts we had going, and went on our first DXpedition."

Since then, Lloyd and Iris have:
Visited 181 countries.
Operated their ham stations in 110 countries.
Earned DXCC Awards in more than 90 countries.
Held more than 140 different calls.
Earned more than 60 awards.
Earned more than 400 certificates.
Worked, they believe, most of the active hams in the world.

Lloyd is named in the very top group of hams on the ARRL's DXCC Honor Roll—with confirmation from all of the 316 countries currently on the DXCC list. He's also worked an additional 37 countries that have been deleted from the list because of political or other changes, Thus, he has a total of 353 countries confirmed, as verified by the ARRL's most recent (June, 1987) report. Iris has confirmations from just one less country on the DXCC list—315. And she has worked an additional 23 countries that used to be on the list, for a total of 339 countries confirmed.

But perhaps their most impressive—indeed, startling—achievement is their collection of more than 525,000 QSL cards. "We have the world's largest collection," Lloyd claims. The cards are filed alphabetically, clearly a major task in itself. Also impressive are the statistics those cards produce:

All the cards weigh close to two tons.
They fill nearly 400 file drawers.

Those drawers occupy some 40 feet of giant metal cabinets.

There are about 1,400 cards in each drawer.

The average drawer weighs ten pounds.

The project took the equivalent of more than four years of full-time effort, 8 hours a day to handle those cards—to open the envelopes, sort, log, and reply.

Yet not quite all their cards are in those files. Lloyd likes to show visitors the 3-inch thick, hard-bound book in which he and Iris have mounted selected cards. Then he says with a playboy's smile: "If I want to start a conversation with an XYL—at a DX conference or someplace—I just show her this book." In it is a collection of hundreds of picture-QSL cards displayed under carefully-labeled headings—airplanes and automobiles, babies and birds, cats and cartoons, and on and on through the entire alphabet.

Iris is quick to respond. She displays another thick book of cards. It contains samples of the great variety of their own QSLs which they've mailed from their DXpeditions around the world.

All those cards came from the more than *one million QSOs* the Colvins say they've made. That many contacts produce monstrous paperwork. For example, in 1984, when they returned from a 6-month DXpedition to 13 countries in South America, they faced 25,000 QSL cards to file. That was *after* weeks of work by three friendly hams who'd volunteered to open envelopes and sort, log, and reply to the cards.

The job of answering cards is made easier and quicker by use of special log sheets which the Colvins designed years ago. Those logs consist of two identical pages with a sheet of carbon paper between. As the Colvins operate, they write the information in the log just as it will appear on the QSL cards they'll send out—Date, GMT on, GMT off, Station, Freq, Mode, RST, Opr. The first-original-page of the logs is their permanent record; the second-carbon page-is cut into strips, each strip an individual contact. The backs of those strips are pre-covered with dry glue so it takes little time to wet them and attach them to the cards—another bonus from such logs: Hams who QSL the Colvins receive cards with the confirmations personally handwritten by these celebrated hams.

Packing Strategy

Computer-logging? Lloyd pauses. Iris answers: "We use a computer for the accounting in our business. But Lloyd doesn't really like computers. I don't think we'll ever use computers in our hamming."

Photo B. Lloyd's WPX certificate, the very first such award issued to anyone, is dated December 1, 1957. The day before, feeling sure that the one more QSL card he needed for the award was sitting in the Alameda, CA, Post Office (which was closed for Sunday) he went to the office, and after repeated pleas, got an official to check the mail and find the final card. The next morning Lloyd flew East and hand-delivered his application just a few hours before a ham from K2-land arrived hoping to receive the first award. (The authorizing signature on Lloyd's award is by Wayne Green.)
(Photo by Leon Fletcher, N6HYK.)

If they did, that would add still more to the 400 pounds of gear they currently haul on their frequent overseas trips. "We spend hours trying to figure out how to reduce that load. We search for even a five-pound saving," Lloyd says. By now, however, after all their travels, their luggage is highly structured.

For their clothes, each takes just one suitcase—"not very big ones." They take a footlocker crammed full with the rotator for their beam, 20 pounds of coaxial cable, fittings, tools, and such. Their antenna (Hy-Gain TH-3) is specially cut so it and a mast fit into a custom-designed canvas bag eight inches in diameter, 6.5 feet long. "All that goes aboard our plane as luggage. We carry the rest of our station ourselves," Iris says. Lloyd adds, "If the airline loses our suitcases with our clothes, we can still operate—we can sit there in our underwear and operate. But we've got to have our gear to get on the air."

Lloyd lumbers aboard airplanes toting as carry-on luggage a 47-pound Tokyo Hi-Power HF band linear amplifier, Model HL-1K/A; a 27-pound ICOM 751 A transceiver; and a small airline-type, under-the-seat bag heavy with bits of gear for their station.

Lloyd smiles as he says, "Here at home I practice carrying that stuff—watching myself in a mirror—trying to look like I'm walking casually with just 20 pounds of luggage. And we *never* put our transceiver and amplifier in any kind of container. We always have it out in full view. That way airport security guards, airlines crews, even custom agents rarely bother us. They can see we're not trying to sneak aboard anything that's illegal."

Sometimes Iris takes over carrying one piece or another of the station, but not recently. Early in 1987, while on Maldive Island (8Q), she and Lloyd were coming down the rickety stairs of the government communications office—"the equivalent of our FCC," Lloyd says. "The bottom step was slanted downward at quite an angle. She slipped, I couldn't catch her, and she landed hard." Her leg was broken near her hip; she was flown to Sri Lanka (4S) for "the best medical service in the area."

Back at their home in October 1987, Iris said, "I'm really feeling pretty good now." But she was still walking with a cane. Occasionally her face showed her pain. Says Lloyd, "She'll always be carrying about a pound of metal in her leg."

Photo C. After every DXpedition, on the roof of the 3-story apartment building they built, Iris and Lloyd reassemble and check every unit of the Hi-Gain TH-3 beam they've used in countries around the world.
(Photo by Leon Fletcher, N6HYK.)

Golden Hints

Based on their vast experience in DXing, the Colvins point to several specific techniques they feel hams should master:

First...the skill they consider the most important, by far: that same old, essential first step—the technique so very many hams still ignore: LISTEN! "Don't ask a DXer his or her call," pleads Lloyd, "They'll give it soon. We give ours every minute or so. Don't call on top of a QSO. Listen. Don't ask for frequencies—listen. Just listen!"

Lloyd likes calling stations to tail-end—to transmit their call just as the previous station is concluding the contact. "But tail-ending should be done *only* at the very end of a contact—*after* all essential information has been passed. And

never call in the middle of a QSO. You need to develop a feeling forwhen's the right moment to tail-end."

That point leads Iris to emphasize the importance of "working at the rhythm of the DX station." By that she means, if the DX station comes back fast, you should respond fast. But if the DX station repeats calls slowly, precisely, you should give your call slowly, precisely—the DX station probably is having trouble copying. If the DX station picks out stations by repeating just two letters, you should call with just two letters and not your entire call. If the DX station is asking operators for their names, you should give your name without being asked.

Another recommendation is implied in Lloyd's observation that "it seems like half of all hams don't know how to work split. Yet that's one of the most valuable tools for DXers."

Lists and nets? "They are important in some situations," Lloyd said. "I'm not against them. We prefer to work on our own, but if conditions make lists or nets necessary, we do them."

Iris and Lloyd both work considerable CW as well as phone. Lloyd says, "I generally work CW at about 25 words-per-minute. I can do a little over 40, but at that speed I have to repeat too much for many hams." He adds, "When calling stations are orderly and the pile-up is not too big, I can do 200 QSOs an hour." That's an average of one every 18 seconds.

The Colvins travel under the sponsorship of a tax-free YASME Foundation. YASME means "Good luck" in Japanese, and was the name of a boat sailing around the world in 1954 by a young Britisher, Danny Weil. On a stopover in the US Virgin Islands, he earned a ham license, then set sail on the world's first extended, continuous, week-after-week DXpedition. The foundation was established in 1961 to help Danny with expenses. In 1964 Danny married and decided to quit DXpeditioning. The next year, the Colvins started DXing under the aegis of YASME, but with the stipulation that they pay all of their own expenses.

Where To Now?

Where will they go on future DXpeditions? "We've been corresponding with government officials in a number of countries for some time, trying to get permission to operate, especially in those places in the top twenty of the most wanted-countries," Lloyd says. "We'll go to the first one that sends us authorization."

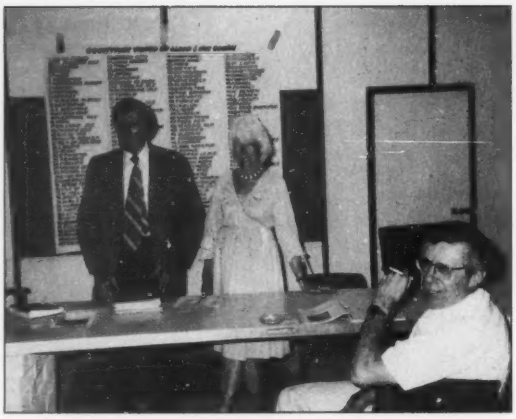

Photo D. Behind the Colvins is the banner listing countries they have visited, a visual they display at most of the many ham meetings at which they speak.

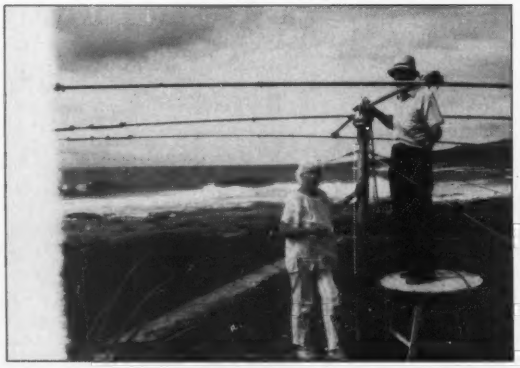

Photo E. When the Colvins worked as D68KG, Comoros, a country on a group of islands in the Indian Ocean, their beam needed frequent adjustment. The beach on which it was set faced constant high winds.

(Photo courtesy of Iris and Lloyd Colvin.)

Photo F. At the railroad station in Windhoek, Namibia, South West Africa, getting ready to take the Colvins to their operating site, a taxi driver lashes to his car the specially-designed canvas bag which contains their dismantled beam and mast.

(Photo courtesy of Iris and Lloyd Colvin.)

The day after this writer interviewed the Colvins, they were to leave on still another DXpedition—to Mexico, to work during upcoming contests. This time, rather than flying, they were to drive. Lloyd pointed to the truck he was about to pack for the trip—an 18-year-old Volkswagen double-cabin veteran which had already traveled nearly 200,000 miles. It seemed like a very modest vehicle for a couple who can afford to travel virtually full time. But earlier, when talking about flying, Lloyd had said, "We never fly first class. We never squander our money—we use it all for DXing."

Clearly, Lloyd means it when he takes Iris's hand—as he does often—and says, "Hamming is *everything* in our lives." Iris nods in agreement.

A few of the more than 140 calls held by the Colvins:

C21NI	- Nauru
CT2YA	- Azores
CT3AU	- Andorra
FK0KG	- New Caledonia
HR0QL	- Honduras
KG4KG	- Guantanamo Bay
TU2CA	- Ivory Coast
TY2KG	- Benin
VP2MAQ	- Monserrat
VP2EEQ	- Anguilla
W6KG/TI5	- Costa Rica
W6QL/6Y5	- Jamaica
YJ8KG	- Vanuatu
ZB2AX	- Gibraltar
ZF2CI	- Cayman Island
3D2KG	- Fiji
5T5KG	- Mauritania
5V1KG	- Togo
6W8CD	- Senegal
9G1KG	- Ghana
9L1KG	- Sierra Leone

Leon Fletcher N6HYK of 274 Webster Drive, Ben Lomond, CA 95005, is the author of several textbooks on public speaking and has written for various publications. 73

by John Hugentober N8FU

The Art of DX QSL

Maximize your QSL return.

[The following article is reprinted from the September, 1987, issue of the Mike and Key *with the permission of editor Paul Riedel WB8NFT]*

Hear an Unusual Prefix on the Air?

1. First Ground Rule—W.F.W.L. (Work First, Worry Later). Even if you suspect a call may be a bootlegger (also called pirate or "slim"), it may appear in *73*, *QST* or *CQ*, as a legitimate operation.

2. To find out the country of the station, consult the Table of Allocation of International Call Sign Series in the *Callbook*. Take for example the call LP2AA. This is found in the range LOA–LWZ, placing it in Argentina. 8J5ITU is found in Japan.

Want a QSL?

1. If you're not concerned with a speedy response, use the Bureau. The Bureau is the only way for some stations since they give no direct address. Unfortunately, some return times are rather slow—three months to two years for the Russians—but often it is the only way.

To use the Bureau, get some 6 x 9 Manila envelopes, and send 3 to 4 of them to the address in front of the *Callbook*. Address the envelopes to yourself and place your call in the upper left-hand corner in large letters (one inch or so high), place at least 22 cents on each envelope, and send to the address shown. They will send them back to you periodically and let you know when you have used the last envelope. This takes care of incoming procedures.

Your Outgoing QSLs

You may send your cards out by mail (air mail is best) to the DX Bureau listed in front of the *Callbook* for all DX including Canada and US possessions (no continental USA.). KH6 and KL7 are considered DX. Some countries do not have QSL bureaus.

If you are an ARRL member, you may package up your DX cards, arranged alphabetically by prefix, and send them to ARRL (Outgoing QSL Division). Include the membership address sticker that was on the wrapper of your *QST* and $1 per pound or fraction (1½ pounds costs $2). You should send this money by check or money order made out to "ARRL". They will then send your cards to the respective bureaus by first-class mail monthly. I use this system extensively with very good results. You may make these mailings once a month if you wish.

"Even if you suspect a call may be a bootlegger (also called pirate or slim), it may appear in 73, QST or CQ, as a legitimate operation."

To QSL direct, send the QSL to the station by air mail, including a self-addressed envelope, preferably 4½" x 6" "tall" envelope. A lot of DX cards are taller than US cards and it is a shame to have the QSL for you folded and spoiled just because you didn't provide a large enough envelope.

There are three ways to cover this postage back to you (Send it along with the tall envelope.):

A. Send a dollar. This is generally not a good idea. Dishonest postal employees abound who steal money from the mail. Also, recipients in many countries may have a hard time exchanging currency, and it may even be illegal for them to have other countries' money in their possession.

B. Send International Reply Coupons (IRCs), available at Post Offices for 80 cents each. One IRC suffices to send your QSL direct, but more than one is required for return air mail (see front of Callbook).

C. Send W2AZX a SASE (Self-Addressed Stamped Envelope) and request his stamp list. This is, in my opinion, the cheapest and best way. He provides stamps for DX countries for a fraction of the IRC costs. Just put the stamps on your envelope that's coming back to you. The sender doesn't have to worry about buying stamps, which should shorten the return time.

The only reason I use direct mailing is if he says this is the only way, or I need his card for DXCC.

Now, if he says QSL VIA manager Joe Ham W2XXX, you want to send a normal-sized SASE along with your card to W2XXX. Place on the back of your envelope going to W2XXX the call of the DX station and the date of the QSO. This allows W2XXX to sort his incoming mail easily and process your card quickly.

Two Important Rules For All DX QSLs

1. Use GMT (also knowm as UTC) on all your DX QSLs. Your contact almost *always* uses this system, and it would be hard, if not impossible, for him to find your QSO on his log if you use local time. It would be especially misleading if he worked you during a contest, where a great number of stations are worked over a many-hour period. In fact, keeping a clock in the shack set to GMT is a good idea. It cuts down the confusion in logging skeds or filling out QSLs.

GMT is Eastern Daylight Savings Time (EDST) plus 4 hours, or Eastern Standard Time (EST) plus 5 hours, using the 24-hour clock. Remember that the new day starts at 2000 EDST. 2001 EDST Friday is 0001 UTC Saturday.

2. Spell out the month, or use day/month system. To a DX station, 8/2/83 reads February 8th instead of August 2nd. August second is best written "2 Aug 83", "2.8.83" or "2.VIII.83". Roman numerals rule out any doubt.

I hope these tips will further your skill in the art of QSLing! 73

Hamming is a family affair for John N8FU, whose wife Carol is K8DHK. Son John, Jr. is KC8MZ, and daughter Melody is KA8LAB. Carol and John are very active in 10-10, and John is the 8-area manager for this organization. John is 48 years old and a postal clerk whose hobbies include (of course!) DXing and stamp collecting.

by Steve Wolf NO8M

In Praise of DX and WAS Nets

These much-maligned nets are more useful than you think.

"Working DX is like fishing . . . you just never know what you're going to catch" —Sen. Barry Goldwater K7UGA

There's a lot of print lamenting the crowded conditions on our amateur radio bands. Contesters are criticized for making 40 meters sound like a food processor on puree. DXers are derided for using oodles of band space in pileups in just making the contact instead of *communicating*. And nets! They say it takes divine intervention to find a non-net frequency on 20 meters. All for what? A 23-second contact to exchange the minimum required information to qualify for whatever paper they are chasing.

Do net operators and DXers do anything for amateur radio? You bet! I hope to explain here why they are there and how they can be of value to amateur radio.

DX Net Basics

Net operation is simple in principle. The main feature is the net control operator, the ham who coordinates the contacts made on the net by "checking-in" hams one at a time. He or she coordinates contacts with stations listening on the net. The net controller serves as the master of ceremonies and arbiter, maintaining net discipline and setting the pace of operation. Net controllers ask for check-ins, list callsigns of DX stations available for others to work, then give net participants a chance to work DX stations under relatively controlled conditions.

Nets give the little gun a chance to work some truly rare DX. Modest power and simple antennas are normally enough to get on the list and, once there, work the DX on a clear channel. DX nets are a good way of checking propagation conditions, too. This is due to the large number of stations from all areas of the world that check in—or not, as the case may be—in a short period. Most important, however, nets teach operators discipline and listening skills. Lack of discipline and the inability to listen to and obey the net control is a sure way to guarantee that would-be DXers will not make those desired contacts.

Domestic Awards Nets

In a Worked-All-States (WAS) net, stations from around the country check in with the hope of making a contact with stations in states they have not yet worked. Some people shake their heads at the WAS nets. They are just too easy and not in spirit with the "challenge" of amateur radio. These people are missing the fun of these nets. It is not simply a matter of working and confirming all 50 states. It is a matter of doing it five, ten or fifteen times. It is a matter of qualifying for awards that require a great deal of strategy.

Nets have the appeal of a chess tournament. Various awards programs require operators to amass a certain number of contacts or credit points. Simple contacts with states may count less than contacts with mobile operators in the state, those in the state capital, and other variations. An operator determines what contact he or she would like to make, depending on the "pieces" available on the net and the personal needs to achieve a particular award. The needed stations may take a break, or propagation may fail. Then it is time to consider a secondary strategy. The whole process can become addicting. It is the croquet of amateur radio.

While non-net operation involves some of the same skills, a net assures there are other players in the game. Some of the other players are masters from whom to learn operating skills.

There are very few things that will teach operators propagation better than WAS nets. On a typical net, stations represent all areas of the country. A quick check of callsigns will illustrate to where the band is open. Listening for a bit will show how the band reacts to changes in propagation. Over a period of months operators learn when and to where the bands will open. There are few better qualified amateurs than those who participate on these nets. They are finely attuned to the band and its characteristics. They have been around and noted band trends. Many times they offer propagation predictions no agency could produce. They can also offer guidance to those seeking the rare and elusive contact.

In Case of Emergency

I am in charge of emergency communications for a city of 40,000 residents, a position I have held for more than ten years. I have often considered how I would establish communication links on the HF band. Whom would I call, and what are their chances of success?

I can tell you whom I wouldn't call. The first off the list is the repeater fanatic. There they sit, waxing their rubber ducks, oblivious to spectrum outside of that defined by the input and output of their favorite repeater. Nor would I call the rag-chewer. They may be great talking to someone else about the type of dung used to fertilize their gardens. But when it comes time to pass a serious message under pressure or poor band conditions, they would fall on their face.

No, I would look elsewhere. The first place I would go for traffic destined out of the country would be the local DX repeater. With their (perhaps ridiculous) array of equipment and antennas, DXers are probably overqualified to handle anything I can give them. For domestic traffic, I would look for the person working on the WAS nets. When propagation on one band dies, I need someone who can change bands quickly and know what frequencies to use. I do not need some fool searching forty meters for a clear frequency between the broadcast stations. I need someone who can go to a net and instantly identify a callsign with a location. Net operators who work DX, states, or counties together have these skills.

I need commitment. I need someone who can recognize a goal and stick with me. Times will get boring, I don't need someone who goes off the air if they don't handle a message for over an hour. An award hunting net operator has the tenacity to stick with his goals, even though the odds may be against him. And above all, such an operator has discipline coupled with skill, an unbeatable combination when the chips are down.

Hearing an award net transform into an emergency net is a remarkable event. Many in the net have worked together for many years and know how each operates and their capabilities. The transition is smooth and professional. I can find that knowledge, that commitment, and that equipment in competitive net operators. 73

Steve is a police officer in Olmsted OH in charge of emergency communications for the police department. He is involved in local-area and county emergency preparedness and writes for amateur radio publications. His address is: Steve Wolf NO8M, 27132 Butternut Ridge Road, N. Olmsted OH 44070-4417.

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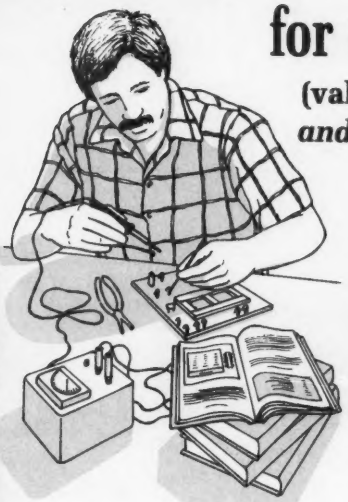

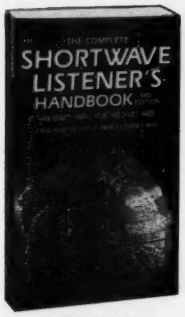

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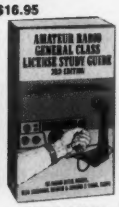

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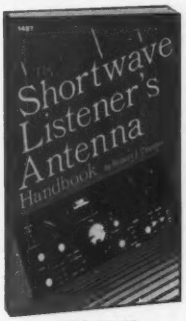

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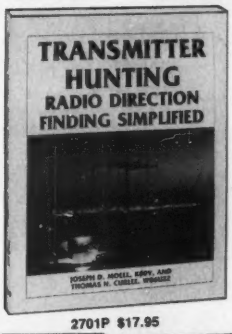

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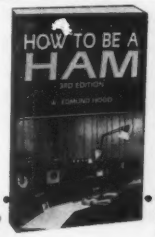

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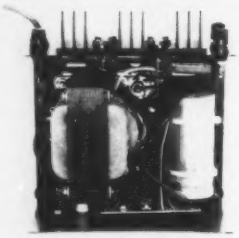

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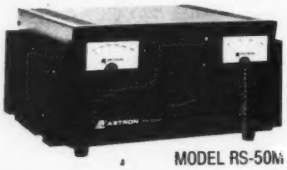

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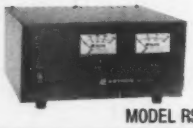
RS-5A	4	5	3½ × 6⅛ × 7¼	7
RS-7A	5	7	3¾ × 6½ × 9	9
RS-7B	5	7	4 × 7½ × 10¾	10
RS-10A	7.5	10	4 × 7½ × 10¾	11
RS-12A	9	12	4½ × 8 × 9	13
RS-12B	9	12	4 × 7½ × 10¾	13
RS-20A	16	20	5 × 9 × 10½	18
RS-35A	25	35	5 × 11 × 11	27
RS-50A	37	50	6 × 13¾ × 11	46

RS-M SERIES



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• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

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RS-12S	9	12	4½ × 8 × 9	13
RS-20S	16	20	5 × 9 × 10½	18

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

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Computerized Frequency Readout

by William Bawn, Jr. WA9RDE

Digital dial accuracy for the Yaesu FRG-7.

For years I had wanted to add a digital frequency display to my Yaesu FRG-7 general coverage receiver to improve the accuracy of my shortwave loggings. My experience with this receiver has shown that the calibration of the mechanical dial is not accurate across its full range.

While reviewing titles on the shelf in the computer section of a local bookstore I happened upon Easy Interfacing Projects for the Commodore 64. This book includes a project for a frequency counter which is the basis of my digital frequency display.

PARTS LIST C-64 DIGITAL FREQUENCY DISPLAY INTERFACE

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R3	4700 Ohm		
R4	240 Ohm		
R5,R8	390 Ohm		
R6	6800 Ohm		
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Q2,Q3	2N4401	(276-2058)	.49 each
D1,D2	IN918/4148	(276-1122)	10/.99
IC1,IC2	7490	(276-1808)	1.19 each
	12/24 connector (connect to C-64 users port)	TRWR -405	2.58
Misc.	•2/c cable W/shield-to connect interface to 12/24 connector •Metal enclosure for interface circuitry •(Universal) printed circuit board		

Part numbers in parentheses refer to Radio Shack catalog numbers.

Inside the Receiver

The FRG-7 receiver uses a main dial tuning VFO which varies from 3455 KHz to 2455 KHz to tune across the selected megahertz band. The VFO is at 3455 on the low end of the dial and at 2455 on the high end. It tunes backwards. This technique, as well as several others, is common in modern receivers. Articles by Thomas M. Miller WA8YKN in the July '85 and May '85 issues of *73 Amateur Radio* aptly describe these designs. By monitoring the VFO frequency and subtracting from 3455 KHz, the received frequency can be calculated. Whereas dedicated hardware can be applied to this number crunching and display task, I let my C-64 handle this chore. The computer needn't be dedicated to the frequency display, either. An additional line or two of Basic will allow you to easily enter and exit this program so that the computer may also be used for other things.

An interface circuit is required to connect the receiver to the computer. The electronic components and the 12/24 connector shouldn't cost more than ten bucks. Adding a small mini-box, circuit board, and other miscellaneous items should still keep the total cost of this project around twenty dollars.

The interface schematic appears in Figure 1. The front of the interface (Q1, Q2, Q3) is from a frequency counter project appearing in the 1986 edition of the ARRL Handbook. This circuit couples to the receiver's VFO buffer amp. In the FRG-7 this point is a conveniently labeled test point TP404 on the IF-AF circuitboard. The two 7490 ICs are wired to divide the VFO frequency by 100. They provide waveshaping as well as TTL compatability to the C-64. In addition, they are required to prescale the count so as not to exceed the 65,535 event limit of the input register of the computer.

Circuit layout is not critical. I used a small universal printed circuitboard which was mounted in an aluminum box and installed inside of the receiver itself. The connection to the VFO is made using a short piece of shielded cable. The cable to the computer is a two-conductor (+5 volts and CNT2) with shield (6ND).

The Program

The following line-by-line description of the program should provide you with enough information to explain its operation, allowing you to customize the program to your specific needs. I generally avoid using REMark statements within my programs. Instead I use separate, more lengthy explanations filed away with my hardcopy listing. I have been generous with line numbers to allow you plenty of room to modify the program for your own purposes.

Lines 10-110: Screen Display

The DATA statements are the Commodore ASCII character codes which are POKED to the screen in lines 80, 90, and 100, and form the outline of the frequency display dial. Line 70 clears and blanks the screen while the display is constructed. Line 110 turns the screen ON again.

Lines 120-320: Counter Routine

The counter routine is a machine language program taken from Easy Interfacing Projects for the Commodore 64. Lines 120-240 contain the machine language program itself and lines 250-280 read the program into memory beginning at address 49152. Line 290 sets the timebase to one second, POKEs this value into memory (line 300), and starts the counter with the SYStem command in line 310. The counter is read in line 320.

Lines 330-350: Calculating Frequency

Line 330 calculates the receiver's frequen-

cy. The actual number of counts is 65535-Count. This number is then subtracted from the low end of the dial (VFO frequency of 3455 KHz) to calculate the frequency display value. Lines 340 and 350 adjust the number for cases where the main dial is above or below the elected megahertz band.

Lines 360-470: Frequency Display Format

Line 360 converts the frequency number into a STRing which allows easy formatting of the display frequency on the screen. F$=MID$(F$,2) deletes the leading space which Basic automatically inserts for the sign of the number (+ or -).

Line 370 adds leading spaces to the string and then limits the string length to five spaces from the right.

Lines 380 to 420 assign variables to each of the five characters of the string. Lines 430 and 440 POKE the frequency to the screen. Note that the decimal point and trailing zero are fixed by this statement.

Line 450 is required to slow down the program while the counter is updated. Line 460 allows you to exit the program and return to Basic by hitting the RETURN key which sends the program to line 480 to clear the screen and execute a computer warm start. Line 470 loops the program to update the display if the RETURN key has not been pressed.

Program Modifications

The timebase for the counter makes use of the C-64's internal clock interrupt which occurs every 1/60th of a second. Commodore calls these intervals jiffies. The timebase of the frequency counter may be programmed in multiples of jiffies. This is done in line 290 where I have selected 60 jiffies, which equal one second. If you change the timebase be sure to modify the frequency calculation in line 330 accordingly. If, for example, you select a timebase of 6 jiffies (1/10 second), the frequency calculation needs to be muliplied by 10. One way to accomplish this would be to add a line 335 F=Fx10.

The program printed here is only a portion of the one I actually use. By defining other conditions (keyboard commands) in the GE7 statement of line 460, you can jump to other programs such as a logbook, RTTY/CW, etc. I use this technique to redefine the frequency calculation when using a VLF converter with my receiver. My converter monitors the 10 to 500 KHz frequencies by tuning the 3510 to 4000 KHz portion of the receiver's dial. I use the SPACE bar to tell the program to subtract an additional 500 KHz from the VFD frequency when using the VLF converter, and to display a message at the bottom of the screen to remind me that this feature has been selected. (The programming techniques for this are beyond the scope of this article.)

If you want a digital display that tracks the movement of the receiver's dial as rapidly as you can crank it, this project will fall short of your expectations. If you're willing to wait a couple of seconds for the frequency display to stabilize each time you reposition your receiver's dial, then you will find this presentation satisfactory.

I've cross-checked the frequency to the listed frequency of known commercial and fixed service stations and I find that I'm within 200 Hz. In contrast the calibration of my receiver's dial is within 5 kHz in the center and can be off by 30 kHz at either end. This simple project has improved the accuracy of my SWL loggings immensely. 73

William E. Bawn, Jr. WA9RDE lives at 10510 Inca Street in Northglenn, Colorado 80234.

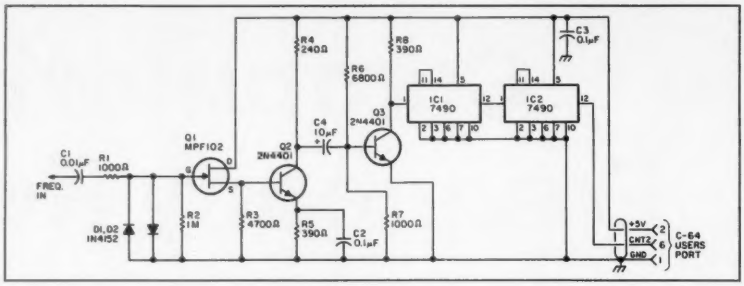

Figure 1.

```
10 REM COMMODORE 64 DIGITAL FREQUENCY DISPLAY
20 DATA236,226,226,226,226.226
30 DATA226,226,226,226,226,226,226,251
40 DATA97,32,32,32,32,32,32,32,32,11,8,26,225
50 DATA252,98,98,98,98,98,98,98,98
60 DATA98,98,98,254
70 PRINTCHR$(147):POKE53281,14
80 FORZ=0TO12:READX:POKE1197+Z,X:NEXTZ
90 FORZ=0TO12:READX:POKE1237+Z,X:NEXTZ
100 FORZ=0TO12:READX:POKE1277+Z,X:NEXTZ
110 POKE53281,1
120 DATA8,120,169,20,141
130 DATA20,3,169,192,141
140 DATA21,3,169,3,141
150 DATA13,221,40,88,96
160 DATA72,198,255,240,4
170 DATA104,76,49,234,165
180 DATA251,133,255,169,0
190 DATA141,14,221,173,5
200 DATA221,133,252,173,4
210 DATA221,133,253,169,255
220 DATA141,5,221,141,4
230 DATA221,169,33,141,14
240 DATA221,104,76,49,234
250 FORI=0TO64
260 READX
270 POKE(49152+I),X
280 NEXTI
290 BASE=60
300 POKE255,0:POKE251,BASE
310 SYS49152
320 COUNT=(PEEK(252)*256+PEEK(253))
330 F=(34550-(65535-COUNT))
340 IFF<0THENF=10000+F
350 IFF>10000THENF=F-10000
360 F$=STR$(F):F$=MID$(F$,2)
370 F$=RIGHT$("      "+F$,5)
380 A=ASC(MID$(F$,1))
390 B=ASC(MID$(F$,2))
400 C=ASC(MID$(F$,3))
410 D=ASC(MID$(F$,4))
420 E=ASC(MID$(F$,5))
430 POKE1238,A:POKE1239,B:POKE1240,C:POKE1241,D
440 POKE1242,46:POKE1243,E:POKE1244,48
450 FORW=1TO1000:NEXTW
460 GETA$:IFA$=CHR$(13)GOTO480
470 GOTO320
480 PRINTCHR$(147):SYS58235
```

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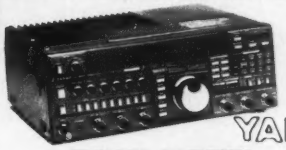

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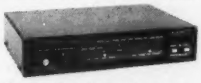

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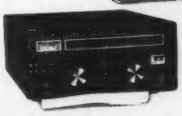

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TIME(UTC)	NET	FREQUENCY	DAY
00:00	Bulletin	3.524 MHz	Daily
★00:00	DX Net	14.243 MHz	Daily
★01:00	Brasil DX Net	14.180 MHz	Mon.
01:00	Hawaiian Cocktail Net	14.305 MHz	Daily
01:00	IARS Net (USA)	14.297 MHz	Daily
★★01:00	Rare Russian DX Net	3.640 MHz	Wed.
02:00	CHC Net (USA)	14.297 MHz	Daily
★02:00	Gulf Coast DX Net	3.787 MHz	Daily
★02:00	NCDXF DX Bulletin	14.002 MHz	Mon.
02:00	Pacific Net	14.313 MHz	Daily
02:30	Seafarers Net	14.313 MHz	Daily
★03:00	Arabian Knights Net	14.250 MHz	Thu-Fri.
★★03:00	Brown Sugar DX Net	14.309 MHz	Daily
03:00	Gulf DX Net	3.787MHz	Sat, Sun
03:00	UT4UI UF6-Land DX Net	7.019 MHz	N/A
★★04:00	International DX Ass.	14.263 MHz	Daily except Wed.
★04:00	Rare Russian DX Net	7.045 MHz	Fri–Sun.
04:30	ANZA Net	21.203 MHz	Daily
★05:00	220 Net Jim Smith P29JS	14.220 MHz	Daily
05:00	European Weather Net	3.680 MHz	Mon.–Fri.
★05:00	Pacific Net	14.314 MHz	Daily
05:00	Trans Pacific Net	14.052 MHz	Sat.
★★06:00	40 Mtr. DX Net	7.080 MHz	Daily
06:00	Young Lady Pacific Net	14.220 MHz	Mon.
★★06:00	Arabian Knights Net	14.250 MHz	Fri.
06:00	Intern. Pacific Net	14.265 MHz	Fri.
06:30	IARS Net (UK)	14.297 MHz	Daily
★06:30	DX Net	14.243 MHz	Sat.
06:30	Antilles Weather Net	3.815 MHz	Daily
★★07:00	220 Net	14.220 MHz	Tue.
07:00	Ship Service Net	14.313 MHz	Daily
★★07:00	ZL DX Net	7.085 MHz	Sun-Thur.
07:45	Medical Assistance Net	14.334 MHz	Daily
07:45	IARS Net (USA)	7.230 MHz	Sat.
08:00	Intern. Island Pacific Net	14.315 MHz	N/A
08:00	Intern. Pacific Net	14.250 MHz	Daily
★09:00	10 Mtr. DX Net	28.520 MHz	Daily
09:00	Amsat Austria Net	7.070 MHz	Sun.
09:00	Australia Net	14.302 MHz	Daily
09:00	Canary Net	7.035 MHz	Daily
09:00	New Zealand Net	3.650 MHz	Sun.
09:00	P-29 Net	14.257 MHz	Sun.
09:00	Pacific DX Net KX6PO	14.345 MHz	Sun.
09:00	South Africa Net	14.280 MHz	Sun.
09:00	Triple "H" Net	7.250 MHz	Daily
09:00	YL DX Net	14.333 MHz	Daily
09:30	Alaska Net	14.292 MHz	Daily
09:30	Austria Net	3.600 MHz	Sun.
10:00	Amsat Australia Net	3.680 MHz	Sun.
10:00	Amsat Europe Net	14.280 MHz	Sat.
★10:00	International DX Net	21.157 MHz	Daily
10:00	Isle of Man Net	7.090 MHz	Sun.
10:00	South Pacific Net	28.555 MHz	Sun.
11:00	Amsat Pacific Net	14.305 MHz	Sun.
11:00	DK9KE Net	21.155 MHz	Daily
★11:00	DX Net	14.195 MHz	Wed.
★★11:00	Friendly Caribbean Net	14.283 MHz	Daily
11:00	Intern. Assistance and Traffic	14.302 MHz	Daily
★12:00	African Service Net	21.317 MHz	Sun.
★12:00	DX Info Net RTTY	14.098 MHz	Daily
★12:00	East Asia Net	14.320 MHz	Daily
12:00	Intern. Young Lady Net	14.332 MHz	Daily
12:00	Sea Net (East Asia Net)	14.320 MHz	Daily

TIME (UTC)	NET	FREQUENCY	DAY
★12:00	Trans-Atlantic Net	21.400 MHz	Sun.
13:00	Central Indonesia Net	21.300 MHz	Daily
13:00	Waterway Net	7.268 MHz	Daily
13:45	Waterway Net	3.945 MHz	Daily
14:00	Rare DX Net, JY32H	14.223 MHz	Most Days
★14:00	W7PHO Net	14.227 MHz	Daily
14:00	SU1PL and EA6MR Info.	14.212 MHz	Sat.
15:00	W1AW Bulletin	14.068 MHz	Mon, Wed, Fri
★★15:00	Family Hour	14.225 MHz	Daily
15:00	Kate's Navy Net	14.295 MHz	Daily
15:00	Russian Island Net	14.150 MHz	Mon.
15:00	Snooky's Net	21.335 MHz	Daily
15:30	Serape Net	7.285 MHz	Sun.
★16:00	All-India Net	14.150 MHz	Daily
16:00	Coast Guard Net	14.313 MHz	Daily
16:00	Intern. Handicappers Net	14.287 MHz	N/A
★16:00	Sri Lanka Net	14.230 MHz	Mon.
16:30	Firac Net	3.680 MHz	Wed.
17:00	Alaska Pacific Net	14.292 MHz	N/A
17:00	Aphrodite Net	28.500 MHz	Mon.
★★17:00	Family Hour	14.225 MHz	Daily
17:00	Good News Net	14.250 MHz	Daily
17:00	Intercontinental Traffic Net	21.390 MHz	Daily
17:00	International Police Net	21.400 MHz	Sun.
★17:00	KH6 Net	14.340 MHz	Mon.
17:00	Norway Net	14.320 MHz	Mon.
17:00	Roundtable DX Net	14.175 MHz	N/A
17:30	DIG Net	3.677 MHz	Thur.
17:30	DX to DX Net J73LC	21.280 MHz	Daily
17:30	KH6 Net	14.340 MHz	Fri.
★17:45	Veron DX Net	3.602 MHz	Fri.
★★18:00	Africa Round Table Net	14.180 MHz	Thur.
18:00	Afrikaaner Net	21.355 MHz	Sept. to Easter
18:00	DARC Info Net	3.750 MHz	Fri.
18:00	DIG CW Net	3.555 MHz	Wed.
★18:00	DX Info Net	3.740 MHz	Mon.
★★18:00	French DX Info Net	14.170 MHz	Daily
18:00	Paradise Island Net	21.285 MHz	Daily
★★18:00	Smokies Net	14.183 MHz	Daily
18:30	African Safari Net	21.292 MHz	Daily
19:00	Children's Hour	2.738 MHz	Daily
19:00	Family Net	7.288 MHz	Daily
19:00	Manama Net	14.340 MHz	Daily
★19:00	Round Table DX Net	14.175 MHz	Daily
★19:00	Snooky KAIE	14.183 MHz	Daily
★19:30	DX Net	3.767 MHz	Mon.
★19:45	Veron DX News	3.062 MHz	Fri.
★20:00	YL DX Net	14.333 MHz	Daily
★20:00	160 Mtr. Net	1.849 MHz	Daily
20:00	Confusion Net	14.305 MHz	Daily
20:00	Pacific DX Net	21.292 MHz	Fri–Sat.
★20:00	W7PHO Evening Net	14.227 MHz	Daily
★21:00	Russian DX Net	3.640 MHz	Thur.
22:00	Amsat South Pacific Net	28.878 MHz	Sat.
★22:00	Far East Net	14.178 MHz	Fri–Sun.
22:00	Maritime Net	14.313 MHz	Daily
22:00	United Nations Net	14.250 MHz	Tue.
★23:00	Central America Net	21.400 MHz	Daily
★★23:00	Family Hour	14.225 MHz	Daily
23:00	Greenland Net	3.650 MHz	Wed, Sun.
★23:00	Japan Net	21.330 MHz	Sun.
★23:30	Intern. DX Net Evening	14.236 MHz	Daily except Wed.

HF Equipment	Regular	SALE
IC-761 HF xcvr/SW rcvr/ps/AT	2499.00	2149
HM-36 Scanning hand microphone	44.50	
SP-20 Ext. speaker w/audio filter	149.00	139.95
FL-101 250 Hz 1st IF CW filter	69.95	
FL-53A 250 Hz 2nd IF CW filter	108.00	99.95
FL-102 6 kHz AM filter	56.00	
EX-310 Voice synthesizer	46.00	

IC-751A 9-band xcvr/.1-30 MHz rcvr	1649.00	1399
PS-35 Internal power supply	199.00	179.95
FL-32A 500 Hz CW filter (1st IF)	66.50	
FL-63A 250 Hz CW filter (1st IF)	54.50	
FL-52A 500 Hz CW filter (2nd IF)	108.00	99.95
FL-53A 250 Hz CW filter (2nd IF)	108.00	99.95
FL-33 AM filter	35.25	
FL-70 2.8 kHz wide SSB filter	52.00	
RC-10 External frequency controller	39.25	

IC-735 HF transceiver/SW rcvr/mic	999.00	869.95
PS-55 External power supply	199.00	179.95
AT-150 Automatic antenna tuner	445.00	349.95
FL-32A 500 Hz CW filter	66.50	
EX-243 Electronic keyer unit	56.00	
UT-30 Tone encoder	17.50	

Other Accessories	Regular	SALE
IC-2KL 160-15m solid state amp w/ps	1999.00	1699
PS-15 20A external power supply	169.00	154.95
PS-30 Systems p/s w/cord, 6-pin plug	299.00	269.95
MB Mobile mount, 735/751A/761A	24.50	
SP-3 External speaker	61.00	
SP-7 Small external speaker	49.00	
CR-64 High stab. ref. xtal for 751A	63.00	
PP-1 Speaker/patch	179.00	164.95
SM-6 Desk microphone	44.95	
SM-8 Desk mic - two cables, Scan	78.50	
SM-10 Compressor/graph EQ, 8 pin mic	136.25	124.95
AT-100 100W 8-band auto. antenna tuner	445.00	389.95
AT-500 500W 9-band auto. antenna tuner	559.00	489.95
AH-2 8-band tuner w/mount & whip	625.00	549.95
AH-2A Antenna tuner system, only	495.00	429.95
GC-5 World clock	91.95	89.95

VHF/UHF base multi-modes	Regular	SALE
IC-275A 25W 2m FM/SSB/CW w/ps	1199.00	1049
IC-275H 100W 2m FM/SSB/CW	1389.00	1229
IC-475A 25W 440 FM/SSB/CW w/ps	1399.00	1249

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IC-475H 75W 440 FM/SSB/CW	1599.00	1429
IC-575A 25W 6/10m xcvr w/ps	1399.00	1249

IC-471A* 25W 430-450 CLOSEOUT	979.00	749.95
PS-25 Internal power supply	115.00	104.95
AG-1* Mast mounted preamplifier	99.50	
IC-471H* 75W 430-450 CLOSEOUT	1399.00	989.95
PS-35 Internal power supply	199.00	179.95
AG-35* Mast mounted preamplifier	95.00	

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Accessories common to 271A/H and 471A/H	
SM-6 Desk microphone	44.95
EX-310 Voice synthesizer	46.00
TS-32 CommSpec encode/decoder	59.95
UT-15 Encoder/decoder interface	14.00
UT-15S UT-15S w/TS-32 installed	92.00

VHF/UHF mobile multi-modes	Regular	SALE
IC-290H 25W 2m SSB/FM CLOSEOUT	639.00	549.95
IC-490A 10W 430-440 CLOSEOUT	699.00	399.95

VHF/UHF/1.2 GHz FM	Regular	SALE
IC-27A Compact 25W 2m FM w/TTP mic	429.00	379.95
IC-27H Compact 45W 2m FM w/TTP mic	459.00	399.95
IC-37A Compact 25W 220 FM, TTP mic	499.00	439.95
IC-47A Compact 25W 440 FM, TTP mic	549.00	489.95
PS-45 Compact 8A power supply	139.00	129.95
UT-16/EX-388 Voice synthesizer	34.99	
SP-10 Slim-line external speaker	35.99	
IC-28A 25W 2m FM, TTP mic	459.00	399.95
IC-28H 45W 2m FM, TTP mic	489.00	429.95
IC-38A 25W 220 FM, TTP mic	489.00	429.95
IC-48A 25W 440-450 FM, TTP mic	489.00	429.95
HM-14 Extra TTP microphone	55.50	
UT-28 Digital code squelch	37.50	
UT-29 Tone squelch decoder	43.00	
HM-16 Speaker/microphone	34.00	
IC-900A Transceiver controller	589.00	529.95
UX-29A 2m 25W unit	295.00	269.95
UX-29H 2m 45W unit	339.00	309.95
UX-39A 220MHz 25W unit	349.00	319.95
UX-49A 440MHz 25W unit	339.00	309.95
UX-59A 6m 10W unit	339.00	309.95
IC-3200A 25W 2m/440 FM w/TTP	599.00	529.95
UT-23 Voice synthesizer	34.99	
AH-32 2m/440 Dual Band antenna	37.00	
AHB-32 Trunk-lip mount	34.00	
Larsen PO-K Roof mount	20.00	
Larsen PO-TLM Trunk-lip mount	22.00	
Larsen PO-MM Magnetic mount	22.00	
RP-3010 440MHz 10W FM repeater	1229.00	1089
IC-1200A 10W 1.2GHz FM Mobile	699.00	629.95
IC-1271A 10W 1.2GHz SSB/CW Base	1229.00	1089
AG-1200 Mast mounted preamplifier	105.00	
PS-25 Internal power supply	115.00	104.95
EX-310 Voice synthesizer	46.00	
TV-1200 ATV interface unit	129.00	119.95
UT-15S CTCSS encoder/decoder	92.00	
RP-1210 1.2GHz 10W 99 ch FM xcvr	1479.00	1299
RP-2210 220MHz 25W repeater	1499.00	1329

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Hand-helds	Regular	SALE
IC-2A 2-meters	279.00	249.95
IC-2AT with TTP	299.00	259.95
IC-3AT 220 MHz, TTP	339.00	299.95
IC-4AT 440 MHz, TTP	339.00	299.95
IC-02AT 2-meters	365.00	299.95
IC-02AT/High Power	399.00	339.95
IC-03AT for 220 MHz	449.00	389.95
IC-04AT for 440 MHz	449.00	389.95
IC-u2A 2-meters	299.00	269.95
IC-u2AT with TTP	329.00	289.95
IC-u4AT 440 MHz, TTP	369.00	329.95

Accessories for micros - CALL $

IC-12AT 1W 1.2GHz FM HT/batt/cgr/TTP	459.00	399.95
A-2 5W PEP synth. aircraft HT	499.00	449.95
A-20 Synth. aircraft HT w/VOR	599.00	529.95

Accessories for all except micros	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	74.25
BP-8 800mah/8.4V Nicad Pak - use BC-35	74.25
BC-35 Drop in desk charger for all batteries	74.50
BC-16U Wall charger for BP7/BP8	20.25
LC-11 Vinyl case for Dlx using BP-3	20.50
LC-14 Vinyl case for Dlx using BP-7/8	20.50
LC-02AT Leather case for Dlx models w/BP-7/8	54.50

Accessories for IC and IC-O series	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	47.00
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	37.50
BP-4 Alkaline battery case	15.25
BP-5 425mah/10.8V Nicad Pak - use BC35	58.50
CA-5 5/8-wave telescoping 2m antenna	18.95
FA-2 Extra 2m flexible antenna	11.50
CP-1 Cig. lighter plug/cord for BP3 or Dlx	13.00
CP-10 Battery separation cable w/clip	22.50
DC-1 DC operation pak for standard models	23.25
MB-16D Mobile mtg. bkt for all HTs	24.50
LC-2AT Leather case for standard models	54.50
RB-1 Vinyl waterproof radio bag	34.95
HH-SS Handheld shoulder strap	16.95
HM-9 Speaker microphone	47.00
HS-10 Boom microphone/headset	23.25
HS-10SA Vox unit for HS-10 & Deluxe only	23.25
HS-10SB PTT unit for HS-10	23.25
ML-1 2m 2.3w in/10w out amplifier	SALE 99.95
SS-32M Commspec 32-tone encoder	29.95

Receivers	Regular	SALE
R-71A 100kHz to 30MHz receiver	$949.00	799.95
RC-11 Infrared remote controller	67.25	
FL-32A 500 Hz CW filter	66.50	
FL-63A 250 Hz CW filter (1st IF)	54.50	
FL-44A SSB filter (2nd IF)	178.00	159.95
EX-257 FM unit	42.50	
EX-310 Voice synthesizer	46.00	
CR-64 High stability oscillator xtal	63.00	
SP-3 External speaker	61.00	
CK-70 (EX-299) 12V DC option	12.25	
MB-12 Mobile mount	24.50	
R-7000 25MHz to 2GHz scan rcvr	1099.00	949.95
RC-12 Infrared remote controller	67.25	
EX-310 Voice synthesizer	46.00	
TV-R7000 ATV unit	131.95	119.95
AH-7000 Radiating antenna	89.95	(7)

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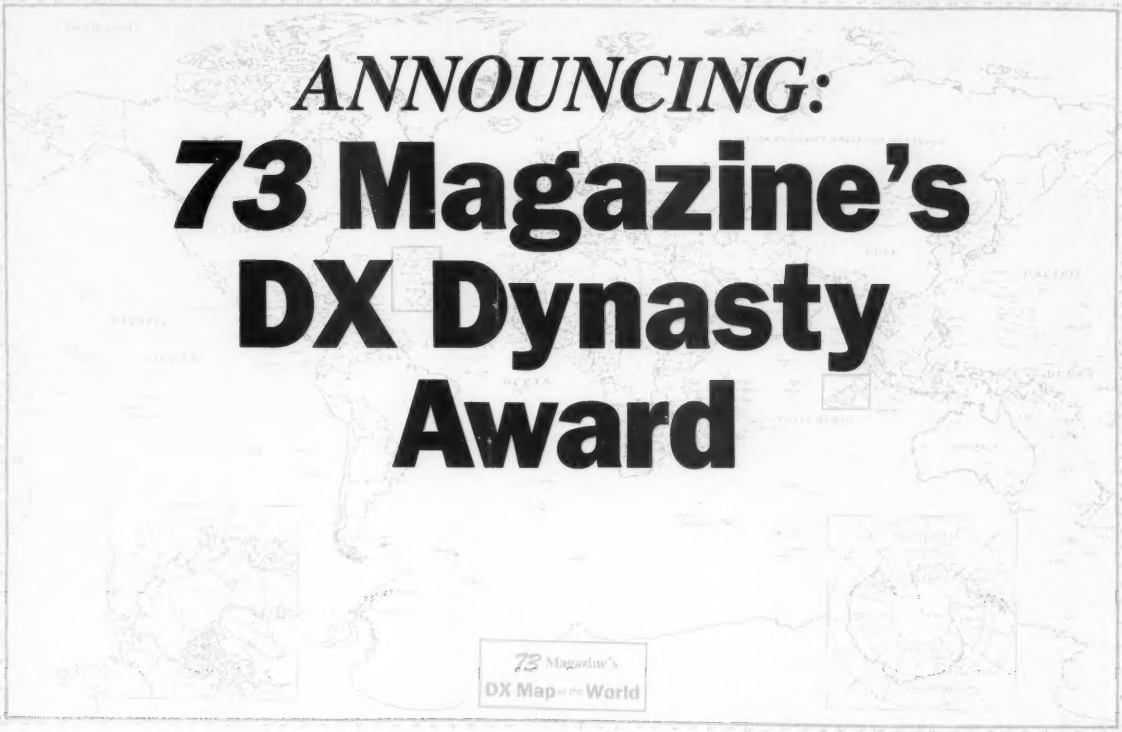
ANNOUNCING:
73 Magazine's DX Dynasty Award



One day not too long ago the staff of *73* was sitting at lunch over at the Folkway talking about DX and DXing and how crazy DXCC had gotten. The DXCC Honor Rollers have nothing left to work, and folks coming into the program have no hope of working countries that haven't been on the air for twenty years.

By the time we got around to coffee and mocha chip cake we had decided to start our own DX award. We wanted everyone to start with zero countries to liven things up a bit on the bands. Wayne suggested that we add to the ARRL's DXCC countries list by searching through the awards programs of IARU members. We decided to offer endorsements for every mode we could think of.

We want you to have fun with this award. The rules are simple, but the variety of levels and endorsements make the award a challenge for both the beginner and the experienced DXer. We've come up with 400 countries, so you won't run out of countries too soon!

The Award

The basic award will be issued for 100 countries worked. Endorsements will be made for 150, 200, 250, 300, 350, 375, and 400 countries worked. The basic award is mixed-mode. Special endorsements are available for single-band operation and for specific modes, including CW, SSB, satellite, Baudot, RTTY, ASCII RTTY, AMTOR, packet, spread-spectrum, QRP (less than 5 Watts output), EME, FM, AM, FAX, SWL, and SSTV. Logs submitted for special endorsements must clearly indicate the band and mode used for all contacts.

THE RULES

Effective Date: Only contacts made after 0001Z on January 1, 1987, will be eligible for the DXD Award.

Bands: Contacts may be made on any amateur band.

Modes: Any mode available to amateurs in your country may be used. Cross-mode contacts are allowed: The mode that you use counts for the DXD Award.

Minimum Report: There is no minimum signal report (you can't work 'em if you can't hear 'em).

Applications: QSL cards are not required for the DXD Award. Application must be made on an official DXD form, available from *73* Magazine–send an SASE to WGE Center, Peterborough NH 03458, Attn: DXDA. On the form, list your contacts in callsign order, indicating date, time, frequency or band, mode, and power. We may, on occasion, ask to see your log—so no funny business.

Fees: The fee for the basic award, due upon application, is US $6. IRCs are not accepted. Each additional endorsement is US $2. *Note: Endorsements requested on your first application are free.*

Country Criteria: Countries on the DXD Award list are taken from the awards programs of IARU member nations. If you come across a country not on the list that you feel should be included, send a copy of award rules from an IARU member that lists that country as being valid for an award to *73* Magazine for evaluation. New countries will be added as needed and announced in *73*.

Countries List: The DXD Award countries list will be printed from time to time in *73*. A copy of the current list (just under 400 countries, but still climbing) and an official application form are available from *73* Magazine, WGE Center, Peterborough NH 03458, Attn: DXDA.

Ready, Set...

Who will be the first to hit the 300 country mark? Everyone has an equal shot at it, starting January 1st. We'll publish a list of DXD Award holders regularly so that you can see how you are doing.

Excuse me, I see that the bands just opened...CQ DX. CQ DX. CQ DX...

To receive a copy of the current DX Dynasty Award countries list and an official application form, send a SASE to 73 Magazine, WGE Center, Peterborough NH 03458, Attn: DXDA. 73's DX Map of the World is available for $5 ppd.

Official DX Dynasty Countries List: 1/1/88

ABU AIL	
AFGANISTAN	YA
AGALEGA ISLAND	3B6
AGALEGA	3B6
ALAND ISLAND	OH0
ALASKA	KL7
ALBANIA	ZA
ALDABRA ISLAND	VQ9
ALGERIA	7X
AMERICAN SAMOA	KS6
AMSTERDAM ISLAND	FT8
ANDAMAN ISLAND	VU4
ANDORRA	C3
ANGOLA	D2
ANGUILLA	VP2E
ANTARCTICA	KC4
ANTIGUA	V2
ANTIPODES ISLAND	ZL
ARAN ISLAND	EJ0
ARGENTINA	LU
ARMENIA	UG
ARUBA	PJ4
ASCENSION ISLAND	ZD8
AUCKLAND ISLAND	ZL4/A
AUSTRALIA	VK
AUSTRIA	OE
AVES ISLAND	YV0
AZERBAIJAN	UD
AZORES ISLANDS	CT2
BAHAMA ISLANDS	C6
BAHRAIN	A9
BAKER ISLAND	KH1
BALEARIC ISLANDS	EA6
BANGLADESH	S2
BARBADOS	8P6
BEAR ISLAND	JW
BELGIUM	ON
BELIZE	V3
BENIN	TY
BERMUDA	VP9
BHUTAN	A5
BOLIVIA	CP
BONAIRE	PJ9
BONIN	JD1
BOPHUTHATSWANA	H5
BOTSWANA	A2
BOUNTY ISLAND	ZL
BOUVET ISLAND	3Y
BRAZIL	PP-PY
BRITISH VIRGIN ISLANDS	VP2V
BRUNEI	V8
BULGARIA	LZ
BURKINA FASO	XT
BURMA	XZ
BURUNDI	9U
BYELORUSSIA	UC
CAMEROON	TJ
CAMPBELL ISLAND	ZL4/A
CANADA	VE
CANARY ISLANDS	EA8
CAPE VERDE ISLANDS	D4
CAPRI ISLAND	IC
CAYMAN ISLANDS	ZF
CELEBES	YB
CENTRAL AFRICAN REPUBLIC	TL
CENTRAL KIRIBATI	T3
CEUTA AND MELILLA	EA9
CHAD	TT
CHAGOS	VQ9
CHATHAM ISLAND	ZL
CHESTERFIELD ISLAND	FK8
CHILE	CE
CHINA	BY
CHRISTMAS ISLAND	VK9X
CLIPPERTON ISLAND	FO0
COCOS ISLAND	TI9
COCOS/KEELING ISLAND	VK9Y
COLOMBIA	HK
COMINO IS	9H
COMOROS	D6
CONGO	TN
COOK ISLAND	ZK1
CORSICA	TK
COSTA RICA	TI
CRETE	SV9
CROZET ISLAND	FB8W
CUBA	CO
CUETA AND MELLILA	EA9
CURACAO	PJ
CYPRUS	5B4
CZECHOSLOVAKIA	OK
DENMARK	OZ
DESECHEO ISLAND	KP5
DESROCHES	VQ9
DIEGO GARCIA	VQ9
DJIBOUTI	J2
DODECANESE ISLANDS	SV5
DOMINICA	J7
DOMINICAN REPUBLIC	HI
EAST CAROLINE ISLANDS	KC6
EAST GERMANY	Y2
EAST KIRIBATI	T3
EASTER ISLAND	CE0
ECUADOR	HC
EGYPT	SU
EL SALVADOR	YS
ENGLAND	G
EQUATORIAL GUINEA	3C
ESTONIA	UR
ETHIOPIA	ET
EUROPA ISLAND	FR/E
FALKLAND ISLANDS	VP8
FAROE ISLANDS	OY
FARQUHAR	VQ9
FERNANDO DE NORONHA	PY0F
FIJI ISLANDS	3D2
FINLAND	OH
FRANCE	F
FRANZ-JOSEF LAND	UA1
FRENCH GUIANA	FY
FUTUNA ISLAND	FW
GABON	TR
GALAPAGOS ISLAND	HC8
GAMBIA	C5
GEORGIA	UF
GHANA	9G
GIBRALTAR	ZB2
GLORIOSO ISLAND	FR/G
GOUGH ISLAND	ZD9
GOZO ISLAND	9H4
GRAHAM LAND	VP8
GREECE	SV
GREENLAND	OX
GRENADA	J3
GUADELOUPE	FG
GUAM	KH2
GUANTANAMO BAY	KG4
GUATEMALA	TG
GUERNSEY	GU
GUINEA	3X
GUINEA-BISSAU	J5
GUYANA	8R1
HAITI	HH
HAWAII	KH6
HEARD ISLAND	VK0
HONDURAS	HR
HONG KONG	VS6
HOWLAND ISLAND	KH1
HUNGARY	HA
ICELAND	TF
IFNI	EA9
INDIA	VU
INDONESIA	YB
IRAN	EP
IRAQ	YI
IRELAND	EI
ISCHIA	IC
ISLE OF MAN	GD
ISRAEL	4X
ITALY	I
IVORY COAST	TU
JABAL ATTAIR	
JAMAICA	6Y
JAN MAYEN ISLAND	JX
JAPAN	JA
JARVIS ISLAND	KH5
JAVA	YB
JERSEY	GJ
JOHNSTON ISLAND	KH3
JORDAN	JY
JUAN DE NOVA ISLAND	FR/J
JUAN FERNANDEZ ISLAND	CE0
KALININGRAD	UA2
KAMARAN ISLAND	VS9
KAMPUCHEA	XU
KAZAKH	UL
KENYA	5Z
KERGUELEN ISLAND	FB8W
KERMADEC ISLAND	ZL1/K
KIRGHIZ	UM
KOREA	HL
KURE ISLAND	KH7
KUWAIT	9K
KWAJALEIN	KX6
LABRADOR	VO2
LACCADIVE ISLANDS	VU7
LAMPEDUSA ISLAND	IG
LAOS	XW
LATVIA	UQ
LEBANON	OD
LESOTHO	7P
LESSER ANTILLES	PJ
LEVANZO ISLAND	IF9
LIBERIA	EL
LIBYA	5A
LIECHTENSTEIN	HB0
LINE ISLANDS	T3L
LITHUANIA	UP
LORD HOWE ISLAND	VK2
LUXEMBOURG	LX
MACAO	XX
MACQUARIE ISLAND	VK0
MADAGASCAR	5R
MADDALENA ISLAND	IM
MADEIRA ISLAND	CT3
MALAWI	7Q
MALAYSIA	9M2
MALDIVE ISLANDS	8Q
MALI	TZ
MALPELO	HK0
MALTA	9H
MANIHIKI	ZK1
MARCUS ISLAND	JD
MARIANA ISLAND	KH0
MARION ISLAND	ZS2
MARKET REEF	OJ0
MARQUESAS ISLAND	FO8
MARSHALL ISLAND	KX6
MARTIM VAS ISLAND	PY0
MARTINIQUE	FM
MAURITANIA	5T
MAURITIUS ISLAND	
MAYOTTE	FH
MEXICO	XE
MIDWAY ISLAND	KH4
MINAMI TORI SHIMA	JD1
MIQUELON ISLAND	FP8
MOLDAVIA	UO
MONACO	3A
MONGOLIA	JT
MONSERRAT	VP2M
MOROCCO	CN
MOUNT ATHOS	SY
MOZAMBIQUE	C8
NAMIBIA	ZR3,ZS3
NAURU	C2
NAVASSA ISLAND	KP1
NEPAL	9N1
NETHERLANDS	PA
NETHERLANDS ANTILLES	PJ
NEVIS ISLAND	V47
NEW CALEDONIA	FK
NEW HEBRIDES	YJ
NEW ZEALAND	ZL
NEWFOUNDLAND	VO1
NICARAGUA	YN
NICOBAR ISLAND	VU4
NIGER	5U
NIGERIA	5N
NIUE ISLAND	ZK2
NORFOLK ISLAND	VK9N
NORTH KOREA	D9
NORTH YEMEN	4W
NORTHERN IRELAND	GI
NORWAY	LA
OGASAWARA ISLAND	JD1
OKINO TORI SHIMA	7J
OMAN	A4
PAKISTAN	AP
PALMYRA ISLAND	KH5
PANAMA	HP
PANTELLERIA ISLAND	IH
PAPUA NEW GUINEA	P2
PARAGUAY	ZP
PERU	OA
PETER 1ST ISLAND	3Y
PHILIPPINES	DU
PHOENIX	T3P
PITCAIRN ISLAND	VR6
POLAND	SP
PONZIANI ISLAND	IB0
PORTUGAL	CT
PRINCE EDWARD ISLANDS	VE1
PRINCE EDWARD ISLAND	ZS2
PRINCIPE	S9
PRIVILOF	KL7
PROVIDENCIA ISLAND	HK0
PUERTO RICO	KP4
QATAR	A7
RAPA ISLAND	FO8
REUNION ISLAND	FR/R
REVILLA GIGEDO ISLAND	XF4
RIO DE ORO	EA9
RODRIGUEZ ISLAND	3B9
ROMANIA	YO
RONACDOR CAY	HK0
ROTA ISLAND	KH2
RUSSIA - SIBERIA	UA9-0
RUSSIAN S.F.S.R.	UA
RUSSIAN - URAL MT	UA9-0
RWANDA	9X
RYUKYU ISLAND	JR6
SABA ISLAND	PJ
SABAH	9M6
SABLE ISLAND	VE1
SAIPAN	KH2
SAKHALIN ISLAND	UA9-0
SAN ANDRES ISLAND	HK0
SAN FELIX ISLAND	CE0X
SAN MARINO	T7
SAO TOME	S9
SARAWAK	9M8
SARDINIA	IS
SAUDI ARABIA	HZ
SCOTLAND	GM
SENEGAL	6W
SERRANA BANK	HK0
SEYCHELLES	S79
SICILY	IT9
SIERRA LEONE	9L
SINGAPORE	9V
SINT EUSTATIUS	PJ
SINT MAARTEN ISLAND	PJ
SMOM	1A
SOCIETY ISLAND	FO8
SOCOTRA ISLAND	7O
SOLOMON ISLANDS	H44
SOMALI REPUBLIC	T5
SOUTH AFRICA	ZS
SOUTH GEORGIA ISLAND	VP8
SOUTH ORKNEY ISLAND	VP8
SOUTH SANDWICH ISLAND	VP8
SOUTH SHETLAND ISLAND	VP8
SOUTH YEMEN	7O
SPAIN	EA
SPRATLY ISLAND	1S
SRI LANKA	4S
ST BRANDON ISLAND	3B7
ST HELENA ISLAND	ZD7
ST KITTS	V44
ST LUCIA	J6
ST MARTIN ISLAND	FS
ST PAUL ISLAND	FT8
ST PETER AND PAUL ROCKS	PY0
ST PIERRE ISLAND	FP8
ST VINCENT	J8
SUDAN	ST
SUMATRA	YB
SURINAM	PZ
SVALBARD ISLAND	JW
SWAN ISLAND	HR0
SWAZILAND	3D6
SWEDEN	SM
SWITZERLAND	HB
SYRIA	YK
TADZHIK	UJ
TAIWAN	BV
TANZANIA	5H3
TASMANIA	VK7
THAILAND	HS
TINIAN	KH0
TOGO	5V
TOKELAU	ZM7
TONGA ISLAND	A3
TRANSKEI	S8
TRANSVAAL	T4
TRINIDADE ISLAND	PY0
TRINIDAD AND TOBAGO	9Y
TRISTAN DA CUNHA	ZD9
TROMELIN ISLAND	FR/T
TUAMOTU ARCHIPELAGO	FO8
TUBUAI	FO8
TUNISIA	3V
TURKEY	TA
TURKMEN	UH
TURKS AND CAICOS ISLANDS	VP5
TUSCAN ARCHIPELAGO	IA
TUTUILA ISLAND	KH8
TUVALU	T2
UGANDA	5X
UKRAINE	UB,UT,UY
UNITED ARAB EMIRATES	A6
UNITED NATIONS - NEW YORK	4U1UN
UNITED NATIONS - GENEVA	4U1ITU
UNITED NATIONS - VIENNA	4U1VIC
UNITED STATES	W,K,N,A
URUGUAY	CX
USTICA ISLAND	IE9
UZBEK	UI
VANUATU	YJ
VATICAN CITY	HV
VENEZUELA	YV
VIETNAM	XV
VIRGIN ISLANDS	KP2
WAKE ISLAND	KH9
WALES	GW
WALLIS ISLAND	FW
WAYNE GREEN	W2NSD
WEST CAROLINE ISLAND	KC6
WEST GERMANY	DL
WEST KIRIBATI	T3
WESTERN SAMOA	5W1
WESTERN SAHARA	S0
WILLIS ISLAND	VK9Z
WORLD BANK	4U2
YEMEN	4W
YUGOSLAVIA	YU
YUKON	VY1
ZAIRE	9Q
ZAMBIA	9J
ZANZIBAR	5H1
ZIMBABWE	Z21

DYNASTY 100: The New DX Generation

The first 100 to work 100

1	W1RFW	100 Mixed
2	WB2DIN	100 150 200 250 Mixed
3	KT1A	100 Mixed
4	W3FDU	100 All 20M SSB
5	KA9JOL	100 All SSB
6	WB1BVQ	100 150 All SSB
7	NW7O	100 All SSB
8	AK4H	100 All SSB
9	W3HCW	100 All SSB
10	KZ2W	100 All SSB
11	K9FD	100 150 200 Mixed
12	WD5N	100 Mixed
13	KA9TNZ	100 All SSB
14	K9GBN	100 All SSB
15	N5GAP	100 All SSB
16	WB3FMA	100 All SSB
17	NN6E	100 20M CW
18	AL7HG	100 All SSB
19	N6CGB	100 150 All SSB
20	KI6AN	100 Mixed
21	K9JPI	100 Mixed
22	N4WF	100 150 All SSB
23	K6PKO	100 All SSB
24	KW7J	100 Mixed
25	VE6JO	100 150 Mixed
26	WA4IUV	100 All SSB
27	W4ZFE	100 All SSB
28	N4KMY	100 Mixed
29	W0HBH	100 Mixed
30	K8KJN	100 All SSB
31	KG1V	100 All CW
32	K1KOB	100 Mixed
33	KY3F	100 75M SSB
34	PY2JY	100
35	YC5BEE	100 All SSB
36	YC5BEH	100 All SSB
37	WB9SBO	100 Mixed
38	N0AFW	100 150 200 Mixed
39	KA9MOM	100 All SSB
40	N3II	100 150 200 Mixed
41	W6DPD	100 All SSB
42	KE8GG	100 Mixed
43	VE6VK	100 Mixed
44	KD9RD	100 All SSB
45	W4WJJ	100 All SSB
46	K0HSC	100 All SSB
47	KI6GI	100 150 All SSB
48	IK1APP	100 150 All SSB
49	KJ4RR	100 All SSB
50	K8MDU	100 All SSB
51	N1EIU	100 All 20M SSB
52	K1DRN	100 All 20M SSB
53	WD8REC	100 All SSB
54	ZL2BLC	100 All SSB
55	VE3EFX	100 All SSB
56	W9MCJ	100 All CW
57	N6IV/KL7	100 Mixed
58	KN8D	100 Mixed
59	KC5YQ	100 All SSB
60	WB6ITM	100 Mixed
61	KA2AOT	100 150 All SSB
62	K4LHH	100 All SSB
63	VE2QO	100 All 20M SSB
64	KE5AT	100 All SSB
65	W9SU	100 Mixed
66	W3OOU	100 Mixed
67	NR2E	100 20M CW
68	KF5PE	100 Mixed
69	N3FBN	100 All 20M SSB
70	KB4SJD	100 All CW
71	N3EZX	100 All 20M SSB
72	IK8GCS	100 150 200 250All SSB
73	WB4I	100 All SSB
74	NG1S	100 All SSB
75	WB7UUE	100 All SSB
76	HK4EB	100 All 20M SSB
77	K0BFR	100 All 20M SSB
78	N7GMT	100 150 All SSB
79	AA4VN	100 Mixed
80	KA1LMR	100 All 20M SSB
81	N8AXA	100 All SSB
82	NM2I	100 All SSB
83	KD9YB	100 All SSB
84	HC2CG	100 All SSB
85	VE1BXI	100 All CW
86	YC2OK	100 All 15M SSB
87	N4GNL	100 All SSB
88	GM4UBF	100 All SSB
89	5Z4BP	100 All SSB
90	I0AOF	100 All RTTY
91	VE1BN	100 40M CW
92	KA2NRR	100 All SSB
93	5Z4DU	100 150 All SSB
94	KB8ZM	100 All SSB
95	HK4CCW	100 All SSB
96	W2JQ	100 All CW
97	HC2AGT	100 All 20M SSB
98	WD5N/M	100 All Mobile
99	VE1BHR	100 All SSB
100	VE1AGZ	100 All SSB

This rig's DXing days are over.

Wayne Green and Art Brothers testing the life out of a National 300. (New York City, 1958)

NEW! CB Radios & Scanners

Communications Electronics,™ the world's largest distributor of radio scanners, introduces new models of CB & marine radios and scanners.

NEW! Regency® TS2-RA

Allow 30-90 days for delivery after receipt of order due to the high demand for this product.

List price $499.95/**CE price $339.95**

12-Band, 75 Channel • Crystalless • AC/DC

Frequency range: 29-54, 118-175, 406-512, 806-950 MHz.

The *Regency* TS2 scanner lets you monitor Military, Space Satellites, Government, Railroad, Justice Department, State Department, Fish & Game, Immigration, Marine, Police and Fire Departments, Aeronautical AM band, Paramedics, Amateur Radio, plus thousands of other radio frequencies most scanners can't pick up. The *Regency* TS2 features new 40 channel per second *Turbo Scan*™ so you wont miss any of the action. Model **TS1-RA** is a 35 channel version of this radio without the 800 MHz. band and costs only $239.95.

Regency® Z60-RA

List price $299.95/**CE price $148.95/SPECIAL**

8-Band, 60 Channel • No-crystal scanner

Bands: 30-50, 88-108, 118-136, 144-174, 440-512 MHz.

The *Regency* Z60 covers all the public service bands plus aircraft and FM music for a total of eight bands. The Z60 also features an alarm clock and priority control as well as AC/DC operation. Order today.

Regency® Z45-RA

List price $259.95/**CE price $139.95/SPECIAL**

7-Band, 45 Channel • No-crystal scanner

Bands: 30-50, 118-136, 144-174, 440-512 MHz.

The *Regency* Z45 is very similar to the Z60 model listed above however it does not have the commercial FM broadcast band. The Z45, now at a special price from Communications Electronics.

Regency® RH256B-RA

List price $799.95/**CE price $329.95/SPECIAL**

16 Channel • 25 Watt Transceiver • Priority

The *Regency* RH256B is a sixteen-channel VHF land mobile transceiver designed to cover any frequency between 150 to 162 MHz. Since this radio is synthesized, no expensive crystals are needed to store up to 16 frequencies without battery backup. All radios come with CTCSS tone and scanning capabilities. A monitor and night/day switch is also standard. This transceiver even has a priority function. The RH256 makes an ideal radio for any police or fire department volunteer because of its low cost and high performance. A *60 Watt* VHF 150-162 MHz. version called the **RH606B-RA** is available for $459.95. A UHF 15 watt, 10 channel version of this radio called the **RU150B-RA** is also available and covers 450-482 MHz. but the cost is $439.95.

Bearcat® 50XL-RA

List price $199.95/**CE price $114.95/SPECIAL**

10-Band, 10 Channel • Handheld scanner

Bands: 29.7-54, 136-174, 406-512 MHz.

The *Uniden Bearcat* 50XL is an economical, handheld scanner with 10 channels covering ten frequency bands. It features a keyboard lock switch to prevent accidental entry and more. Also order the new double-long life rechargeable battery pack part # **BP55** for $29.95, a plug-in wall charger, part # **AD100** for $14.95, a carrying case part # **VC001** for $14.95 and also order optional cigarette lighter cable part # **PS001** for $14.95.

PC 22

NEW! Scanner Frequency Listings

The new Fox scanner frequency directories will help you find all the action your scanner can listen to. These new listings include police, fire, ambulances & rescue squads, local government, private police agencies, hospitals, emergency medical channels, news media, forestry radio service, railroads, weather stations, radio common carriers, AT&T mobile telephone, utility companies, general mobile radio service, marine radio service, taxi cab companies, tow truck companies, trucking companies, business repeaters, business radio (simplex) federal government, funeral directors, veterinarians, buses, aircraft, space satellites, amateur radio, broadcasters and more. Fox frequency listings feature call letter cross reference as well as alphabetical listing by licensee name, police codes and signals. All Fox directories are $14.95 each plus $3.00 shipping. State of Alaska–**RL019-1**; Baltimore, MD/Washington, DC–**RL024-1**; Chicago, IL–**RL014-1**; Cleveland, OH–**RL017-1**; Columbus, OH–**RL003-2**; Dallas/Ft. Worth, TX–**RL013-1**; Denver/Colorado Springs, CO–**RL027-1**; Detroit, MI/ Windsor, ON–**RL008-2**; Fort Wayne, IN /Lima, OH– **RL001-1**; Houston, TX–**RL023-1**; Indianapolis, IN–**RL022-1**; Kansas City, MO/ KS–**RL011-2**; Los Angeles, CA–**RL016-1**; Louisville/Lexington, KY–**RL007-1**; Milwaukee, WI/Waukegan, IL–**RL021-1**; Minneapolis/St. Paul, MN–**RL010-2**; Nevada/E. Central CA–**RL028-1**; Oklahoma City/Lawton, OK–**RL005-2**; Pittsburgh, PA/Wheeling, WV–**RL029-1**; Rochester/ Syracuse, NY–**RL020-1**; Tampa/St. Petersburg, FL–**RL004-2**; Toledo, OH–**RL002-3**. A regional directory which covers police, fire ambulance & rescue squads, local government, forestry, marine radio, mobile phone, aircraft and NOAA weather is available for $19.95 each. **RD001-1** covers AL, AR, FL, GA, LA, MS, NC, PR, SC, TN & VI. For an area not shown above call Fox at 800-543-7892 or in Ohio 800-621-2513.

Regency® Informant™ Scanners

Frequency coverage: 35-54, 136-174 406-512 MHz.

The new *Regency* Informant scanners cover virtually all the standard police, fire, emergency and weather frequencies. These special scanners are preprogrammed by state in the units memory. Just pick a state and a category. The Informant does the rest. All Informant radios have a feature called *Turbo Scan*™ to scan up to 40 channels per second. The **INF1-RA** is ideal for truckers and is only $249.95. The new **INF2-RA** is a deluxe model and has ham radio, a weather alert and other exciting features built in for only $324.95. For base station use, the **INF5-RA** is only $199.95 and for those who can afford the best, the **INF3-RA** at $249.95, is a state-of-the-art, receiver that spells out what service you're listining to such as Military, Airphone, Paging, State Police, Coast Guard or Press.

Regency® HX1500-RA

List price $369.95/**CE price $218.95**

11-Band, 55 Channel • Handheld/Portable Search • Lockout • Priority • Bank Select Sidelit liquid crystal display • EAROM Memory Direct Channel Access Feature • Scan delay

Bands: 29-54, 118-136, 144-174, 406-420, 440-512 MHz.

The new handheld *Regency* HX1500 scanner is fully keyboard programmable for the ultimate in versatility. You can scan up to 55 channels at the same time including the AM aircraft band. The LCD display is even sidelit for night use. Includes belt clip, flexible antenna and earphone. Operates on 8 1.2 Volt rechargeable Ni-cad batteries (not included). Be sure to order batteries and battery charger from the accessory list in this ad.

Bearcat® 100XL-RA

List price $349.95/**CE price $178.95/SPECIAL**

9-Band, 16 Channel • Priority • Scan Delay Search • Limit • Hold • Lockout • AC/DC

Frequency range: 30-50, 118-174, 406-512 MHz.

Included in our low CE price is a sturdy carrying case, earphone, battery charger/AC adapter, six AA ni-cad batteries and flexible antenna. Order your scanner now.

★★★ *Uniden CB Radios* ★★★

The *Uniden* line of Citizens Band Radio transceivers is styled to compliment other mobile audio equipment. Uniden CB radios are so reliable that they have a two year limited warranty. From the feature packed PRO 540e to the 310e handheld, there is no better Citizens Band radio of the market today.

PRO310E-RA *Uniden* 40 Ch. Portable/Mobile CB . . . $85.95
NINJA-RA PRO310E with rechargeable battery pack. $99.95
B-10-RA 1.2V AA Ni-cad batt. for Ninja (set of 10) $20.95
PRO520E-RA *Uniden* 40 channel CB Mobile $59.95
PRO540E-RA *Uniden* 40 channel CB Mobile $119.95
PRO710E-RA *Uniden*40 channel CB Base $119.95
PC22-RA *Uniden* remote mount CB Mobile $99.95
PC55-RA *Uniden*mobile mount CB transceiver. $59.95

★★★ *Uniden Marine Radios* ★★★

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SMMX7000-RA Svc. man. for MX7000 & MX5000 . . . $19.95
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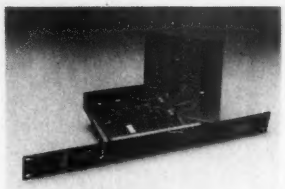

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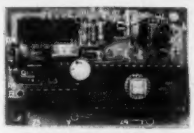

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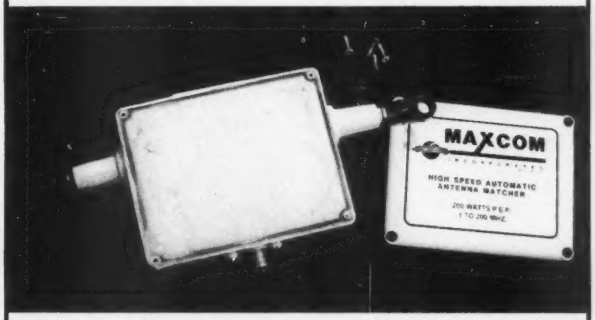

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CIRCLE 101 ON READER SERVICE CARD

International List of DX Publications...

19 ways to keep in touch

The following is a list of DX-related publications that was compiled by Jim Maxwell W6CF.

The DX Family Newsletter
P.O. Box 12
Shinjukukita-Ochiai
Toyko 161 JAPAN

Comments: In Japanese
Seiji Takayanagi JH1FDP
The Japan DX News
P.O. Box 42 Urawa
Saitama 336 JAPAN

The DX Bulletin
Coverage: Amateur radio, DX
Published by: Chod Harris VP2ML
P.O. Box 50, Fulton CA 95439
Size: 8½" x 11", 4pp.
Frequency: 50/yr.

The DXers Magazine
Coverage: Amateur radio, DX
Published by: Gus Browning W4BPD
Frequency: Monthly
Subscription: $15.00/yr.

Inside DX
Coverage: Amateur Radio, DX
Published by: Arthur Hubert N2AU
436 N. Geneva St., Ithaca NY 14850
Size: 8½" x 14", 1 p.
Frequency: Weekly

The KH6BZF Report
Coverage: Amateur radio, propagation
Published by: Lee Wical KH6BZF
45-601 Luluku Rd., CRT #44-11
Kane'Ohe, Hawaii 96744-1854
Size: 8½" x 11", 2pp.
Frequency: Weekly
Subscription: U.S., Canada, Mexico $35.00/yr.
Foreign $47.00/yr airmail

The Long Island DX Bulletin
Coverage: Amateur radio, DX
Published by: The Long Island DX Club
109 Willow Ave., Huntington NY
11743-4204
Size: 8½" x 14", 2pp.
Frequency: Bi-weekly
Subscription: U.S. $14.50/yr.

Long Skip
Coverage: Amateur radio, DX
Published by: The Canadian DX Association (CANAS-X)
PO Box 717, Stn. "Q", Toronto, ON
M4T-2N7, CANADA
Size: 8½" x 11", 32pp.
Frequency: Monthly
Subscription: Canada–CAD $20.00. All other countries $20.00 in U.S. funds. Includes 1st class mailing to Canada and U.S. airmail overseas
Comments: Subscription included with membership in CANAD-X

The Northern California DX Foundation Newsletter
Coverage: Amateur radio, DX
Published by: The Northern California DX Foundation
PO Box 2368, Stanford CA 94305
Size: 8½" x11", 20pp.
Frequency: 2/yr.
Subscription: Worldwide - $25.00 first year, $10.00/yr thereafter
Comments: Subscription included with membership in the Northern California DX Foundation

QRZ DX
Coverage: Amateur radio, DX
Published by: Bob Winn W5KNE, PO Box 834072
Richardson TX 75083
Size: 8½" x 11", 4pp.
Frequency: Weekly
Subscription: U.S., Canada, Mexico–1st class $30.00 for 52 issues, $16.00 for 26 issues. Elsewhere $50.00 for 52 issues airmail

USSR Tidbits
Coverage: Amateur radio, U.S.S.R. activities
Published by: Tom Frenaye K1KI, PO Box 62
Unionville CT 06085
Size: 8½" x 11", 10pp.
Frequency: 5 to 6 issues/yr.
Subscription: One legal size SASE per issue–no more than 3 envelopes at a time. Or, $1.00 for 3 issues. Excess funds (donations accepted) go into the printing fund

The W6GO/K6HHD List
Coverage: Amateur radio, QSL managers
Published by: The W6GO/K6HHD List, PO Box 700
Rio Linda CA 95673-0700
Size: 13½" x 23", 4pp.
Frequency: Monthly.
Subscription: U.S.–$20.00/yr. Canada and Mexico-$25.00/yr. Overseas - $30.00/yr airmail

The DX Family News Letter
Coverage: Amateur radio, DX
Published by: The DX Family Foundation, PO Box 12
Shinjukukita—Ochiai, Tokyo 161, JAPAN
Size: 7¼" x 10½", 10pp.
Frequency: Monthly
Subscription: JYE 6,000 first year, JYE 5,000/yr. thereafter
Comments: In English. subscription included with membership in the DX family Foundation

The DX News Sheet
Coverage: Amateur radio, DX
Published by: The Radio Society of Great Britain
123 Reading Rd., Finchampstead
Wokingham, Berk., RG11 4RD, ENGLAND
Size: 8¼" x11¾", 2pp.
Frequency: Weekly
Subscription: Contact RSGB membership services for subscription information

DX-NL
Coverage: Amateur radio, DX
Published by: DARC, c/o Walter Geyrhalter DL3RK
Box 1328, D-8950 Kaufbeuren
WEST GERMANY
Size: 8¼" x 11⅝", 2pp.
Frequency: 50/yr.
Subscription: Europe DMK 50.00/yr. Airmail DMK $55.00/yr.
Comments: In English

DXPRESS
Coverage: Amateur radio, DX
Published by: VERON, c/o John Fung-Loy PA3CXC
Strausslaan 4, NL-2551 NM Den Haag
The Netherlands.
Size: 5⅞" x 8¼", 6pp.
Frequency: Weekly
Comments: In English. Combined with the VERON

VHF Bulletin
The Heard Island DX Association Newsletter
Coverage: Amateur radio, DX
Published by: The Heard Island DX Association
PO Box 90, Norfolk Island, South Pacific
Size: 5¾" x 8¼", 16pp.

Les Infos du Clipperton DX Club
Coverage: Amateur radio, DX
Published by: The Clipperton DX Club
c/o Yannick Delatouche F6FYD
B.P. 8, F-78570 Andresy, FRANCE
Frequency: Quarterly
Subscription: $10.00/yr.
Comments: In French, some English. Subscription included with membership in the Clipperton DX Club

Les Nouvelles DX
Coverage: Amateur radio, DX
Published by: F6AJA
Size: 8⅛" x 6"
Frequency: Bi-weekly
Comments: In French

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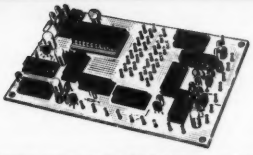

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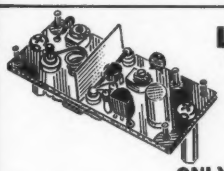

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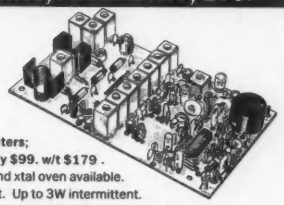

- **FM exciters;** kits only $99. w/t $179. TCXO and xtal oven available. 2W cont. Up to 3W intermittent.
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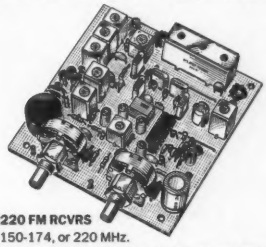

- **R144/R220 FM RCVRS** for 2M, 150-174, or 220 MHz. 0.15uV sens, 8-pole xtal & 10 pole ceramic i-f filters, helical resonator front end for exceptional selectivity, >100dB at ±12kHz (best available anywhere!) Flutter-proof squelch. AFC tracks drifting xmtrs. Xtal oven avail. Kit $149, w/t $229.
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		Antenna Input Range	Receiver Output
VHF		28-32	144-148
MODELS		50-52	28-30
Kit with Case	$59	50-54	144-148
Kit less Case	$39	144-148	28-30
Wired w/case	$89	145-147	28-30
		144-144.4	27-27.4
		146-148	28-30
		220-222	28-30
		220-224	50-54
		222-224	28-30
UHF MODELS		432-434	28-30
Kit with Case	$69	435-437	28-30
Kit less Case	$49	432-436	144-148
Wired w/case	$99	432-438	50-54
		439.25	61.25
		902-928	432-458
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TRANSMIT CONVERTERS

		Exciter Input Range	Antenna Output
For SSB, CW, ATV, FM, etc. Can be linked with receive conv for tranceive. 1 to 2 W out. Linear PA's available up to 50W.	For VHF, Model XV2 Kit $79 (specify band)	28-30	144-148
		28-29	145-146
		28-30	50-52
		27-27.4	144-144.4
		28-30	220-222
		50-54	220-224
		144-148	50-52
		144-146	28-30
	For UHF, Model XV4 Kit $79 Wired $159	28-30	432-434
		28-30	435-437
		81.25	439.25
		144-148	432-436

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Commodore 64/128 vs. US Department of Commerce

Easier DXing with Propagation Predictions

by Jim Cooper KD5EA

Solar flux is on the upswing of its eleven-year cycle, and hams can look forward to more and more good DX on the fifteen- and ten-meter bands. Back to the good old days of 1979, when the sun spot number was on the order of 140.2 (smoothed mean 10cm solar flux of 185). Receivers were wall-to-wall with S-9 signals on 10 and 15 meters from Europe, the South Pacific, Asia, and just about any place else. The long-awaited days of the sun spot high will soon return.

To take full advantage of the propagation to come, an operator must know which way to point the beam, and at what time of the day signals from any predetermined location will appear on the chosen band of operation.

Say, for instance, an operator in the city of Houston TX needs a station in France to complete the requirements for DXCC. On 12 September 1987, he tunes to WWV on 10 MHz at 18 minutes past the hour and hears the solar flux is 95, and the A-Index is 10. It would be nice to know the beam heading and time window in which signals from France are likely to be present along with an indication of the signal quality to expect. The following Commodore 128 program will do just what he wants. (It will run on the Commodore 64 with slight modification, too.)

What the Program Does

The program calculates:

1. The great circle azimuth and distance from the user's site to the desired distant location.
2. The HF MUF of the radio path of choice, in increments of one hour, for any 24-hour day, in UTC as well as local standard time.
3. Optimum Working Frequency (FOT, from the French "Fréquence Optimale du Travail"). This is figured from .85 x MUF, to allow for F-2 layer instability.
4. Expected signal quality.

The program also prints the calculated data in hard copy form (Figure 1).

Program Input Requirements

1. The name of the local city and the distant city (for example: Houston, Paris).
2. The latitude and longitude of each location, obtained from maps, etc.
3. The day and month the prediction is for.
4. The Solar Flux and A-Index figures, from WWV at 18 minutes past the hour.

A word on the A-Index: The A-Index is an indication of the activity of the earth's magnetic fields. A magnetometer measures the activity in Gamma units on a scale from 0 to 400. When the A-Index is up to about 27, the 10- and 15-meter bands are quite noisy. Heaven forbid we should ever see a reading of 400!

In the program an A-Index of less than 10 indicates low ambient noise and excellent signal quality. Figures from 10–20 indicate good conditions, up to 25 is fair, and above 25 is poor. The user can change these figures in code lines 3950–4100 to suit their need.

KD5EA Program vs. Uncle Sam's

Basic MUF programs are fairly common in amateur radio publications. This program calculates FOT to conform better with the ionosphere radio propagation predictions issued by the US Department of Commerce in Boulder CO. It also features azimuth and distance calculations.

The following compares the data output of the Commodore 128 program to the data produced by the US Department of Commerce. The Department data is for January 15th, with a solar flux of 145 for the radio path from Boulder to St. Louis (see Figure 2).

The results from feeding the same variables into the Commodore 128 program:

1. Boulder, St. Louis
2. Lat./Long. of Boulder: 040.03,105.27
3. Lat./Long. of St. Louis: 038.67,090.25
4. Day and Month: 15,01
5. Solar Flux:145
6. A-Index: 10 (Not included in the Dept. of Commerce data).

The Commodore 128 produced the

```
RADIO PATH DATA FOR HOUSTON TO PARIS

THE PATH AZIMUTH IS:  44.52  DEGREES TRUE
THE PATH DISTANCE IS:  4816.4  STAT. MILES

DAY= :  12   MONTH:  9  SOLAR-FLUX:  95  SUN-SPOT #:  38.38

A-INDEX: 10

SIGNAL QUALITY:GOOD

 TIME-UTC      TIME-CST          MUF              FOT

   0100          7PM            13.24            11.25
   0200          8PM            12.86            10.76
   0300          9PM            12.19            10.36
   0400          10PM           11.81            10.03
   0500          11PM           11.5              9.77
   0600          MIDNIGHT       11.25             9.56
   0700          1AM            15.8             13.43
   0800          2AM            15.78            13.42
   0900          3AM            15.14            12.86
   1000          4AM            14.6             12.41
   1100          5AM            19.64            16.69
   1200          6AM            24.49            20.81
   1300          7AM            26.05            22.14
   1400          8AM            26.31            22.36
   1500          9AM            26.37            22.41
   1600          10AM           26.23            22.28
   1700          11AM           25.89            22
   1800          NOON           25.32            21.52
   1900          1PM            24.49            20.81
   2000          2PM            23.33            19.83
   2100          3PM            21.67            18.41
   2200          4PM            18.98            16.13
   2300          5PM            14.75            12.53
   2400          6PM            13.93            11.84
```

Fig. 1. Tabular form of the Commodore 128 MUF program output.

data printed in Figure 3. Comparative analysis of the two data sets shows very little variance. The first variance is the 73.100 of one mile less in distance produced by the Commodore. This is due to the common trigonometric equations used in the Commodore program to calculate distance.

Figure 4 shows the MUF data in graph form. The "O"-line plot is for the US Dept. of Commerce; the "*"-line plot for the Commodore 128 figures. The Commodore 128 program varies somewhat from the DOC plot, but it's well within tolerable limits for HF communications propagation predictions.

This is proof that the Commodore 64/128 program measures up to the DOC program. Now for the programming.

Let's Get to Work

The following program code listing is for the Commodore 128, listed in Figure 5 (*see page 51*). When the program is ready to run, use the input data for Boulder to St. Louis. The data output should match the printout of Figure 3. Enter the input data as follows:

1. The name of City #1 followed by a comma (,) then the name of City #2.
2. The Lat. of City #1, followed by a comma (,) then the Long. of City #1. 40.03 N and 105.27 W is entered as 040.03,105.27. South Lat. and East Long. are entered with a minus (-) sign; for example, -006.00, -060.50.
3. Repeat Step 2 for City #2.
4. Enter two numbers for the day with a comma (,) then two numbers for the month. January 15 is entered as 15,01
5. Enter the Solar flux.
6. Enter the A-Index.

The printer should now print the azimuth and distance as well as the heading for the HF MUF data. At this point the program will pause for up to 45 seconds while the computer crunches the numbers. The computer then prints the 24-hour MUF and FOT.

Although there are many propagation prediction tables published in amateur magazines, and they do serve a need, they are monthly averages at best. This program accommodates the daily changes of the HF MUF.

JANUARY 15, 10 CM FLUX 145 (SSN 100)

BOULDER, COLO.	TO ST. LOUIS, MO.	AZIMUTHS	MILES	KM.
40.03N – 105.27W	38.67N – 90.25W	91.86 281.42	807.1	1298.8

MINIMUM ANGLE 2.0 DEGREES

UT	MUF	FOT	UT	MUF	FOT
01	14.0	11.1	07	8.5*	6.2
02	11.5	9.1	08	8.4*	6.8
03	9.5	7.5	09	8.3	6.7
04	8.0*	6.2	10	7.9*	6.1
05	8.2*	5.7	11	7.8*	5.2
06	8.4*	5.6	12	7.9*	4.9
UT	MUF	FOT	UT	MUF	FOT
13	8.6*	6.7	19	21.8	18.6
14	11.7	10.0	20	21.7	18.6
15	16.1	13.7	21	21.4	18.4
16	19.0	16.1	22	20.7	17.8
17	20.3	17.5	23	19.3	16.6
18	21.1	18.2	24	16.8	14.5

Fig. 2. Tabular form of MUF/Distance/Propagation quality data from the Dept. of Communications for the cities of Boulder CO and St. Louis MO on 15 January, 1987.

Comments, Please

I've experimented with this program over the past six months and learned that when the program indicates the FOT is above 21.450 MHz, and the A-Index is below 10, I have little problem hearing signals from selected locations on the 15-meter band. I'm very interested in the observations and comments of others using this program.

> ***"I'm very interested in the observations and comments of others using this program."***

If you have a lot of trouble de-bugging your program, or you just don't like to type in that much program code, I will send you, for $20, a programmed and tested floppy disk. Each disk contains the HF MUF program for the Commodore 64, as well as for the C-128.

KD5EC resides at 1818 Riverwood Trail, Spring TX (77386) and has enjoyed amateur radio for many years.

References

1. National Bureau of Standards, WWV.
2. Nelson, J.H. *Propagation Wizard's Handbook*
3. Saveskie, Peter N. *Radio Propagation Handbook*


```
RADIO PATH DATA FOR BOLDER TO ST.LOUIS

THE PATH AZIMUTH IS:  91.86  DEGREES TRUE
THE PATH DISTANCE IS:  806.37  STAT. MILES

DAY= :  15   MONTH:  1  SOLAR-FLUX:  145  SUN-SPOT #:  98.87

A-INDEX: 23

SIGNAL QUALITY:FAIR

TIME-UTC      TIME-CST          MUF              FOT

  0100          7PM            15.9            13.51
  0200          8PM            11.56           9.82
  0300          9PM            10.99           9.34
  0400          10PM           10.51           8.93
  0500          11PM           10.12           8.6
  0600          MIDNIGHT       9.8             8.33
  0700          1AM            9.53            8.1
  0800          2AM            9.32            7.92
  0900          3AM            9.15            7.78
  1000          4AM            9.02            7.66
  1100          5AM            8.92            7.58
  1200          6AM            8.83            7.5
  1300          7AM            8.77            7.45
  1400          8AM            13.77           11.7
  1500          9AM            16.91           14.37
  1600          10AM           18.49           15.71
  1700          11AM           19.49           16.56
  1800          NOON           20.12           17.1
  1900          1PM            20.45           17.38
  2000          2PM            20.53           17.45
  2100          3PM            20.34           17.28
  2200          4PM            19.89           16.9
  2300          5PM            19.12           16.25
  2400          6PM            17.91           15.22
```

Fig. 3. Tabular data generated by the Commodore program for the same input as in Figure 2.

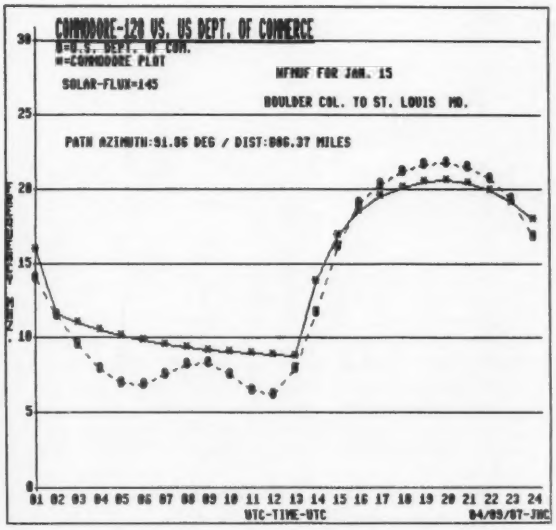

Fig. 4. Graph plot of data in Figures 2 and 3.

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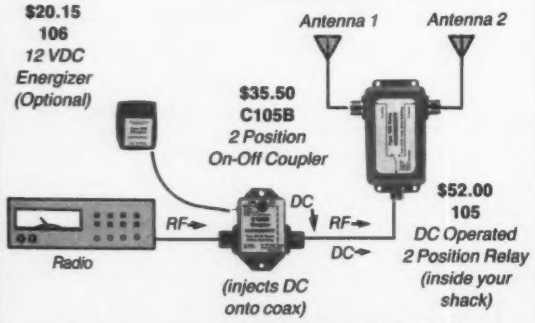

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```
1000 Z$=CHR$(16)
1050 SCNCLR:FAST
1100 COLOR 5,1:COLOR 6,7
1150 B$=CHR$(18)
1200 PRINT B$"  GREAT CIRCLE BEARING/DISTANCE
     AND MAX-USABLE-FREQ PRGM":PRINT
1250 D=1:K=111.11:M=57.29577951:N=60:S=69.041:V$="#######.#"
1300 OPEN 1,4
1350 PRINT
1400 PRINT" ENTER SOUTHERLY LATITUDES AS (-) VALUES":PRINT
1450 PRINT" ENTER EASTERLY LONGITUDES AS (-) VALUES":PRINT
1500 IF D<>1 THEN 1800
1550 PRINT "LOCATION OF TRANSMITTING (,) RECEIVING STATION
     (EXAMP:TEXAS,JAPAN)"
1600 INPUT"";T$,J$:PRINT
1650 PRINT" TRANSMITTING STATION LAT(N/S),LON(W/E)"
1700 INPUT"";A,L1:LL(1)=A:WW(1)=L1:A=A/M:PRINT
1750 PRINT" RECEIVING STATION LAT(N/S),LON(W/E)"
1800 INPUT"";B,L2:LL(2)=B:WW(2)=L2:B=B/M:PRINT
1850 L=(L1-L2)/M
1900 E=SIN(A)*SIN(B)+COS(A)*COS(B)*COS(L)
1950 D=-ATN(E/SQR(1-E*E))+1.57079
2000 C=(SIN(B)-SIN(A)*E)/(COS(A)*SIN(D))
2050 C=-ATN(C/SQR(1-C*C))+1.57079
2100 C=C*M
2150 IF SIN(L)<0 THEN C=360-C
2200 PRINT
2250 C=INT(C*100)/100
2300 X=INT(S*D*M*100)/100
2350 PRINT
2400 PRINT#1,"RADIO PATH DATA FOR "T$" TO "J$:PRINT#1
2450 PRINT#1,"THE PATH AZIMUTH IS: "C" DEGREES TRUE"
2500 PRINT#1,"THE PATH DISTANCE IS: "X" STAT. MILES":
     PRINT#1:PRINT#1
2550 A$=CHR$(17)
2600 B$=CHR$(18)
2650 C$=CHR$(19)
2700 D$=CHR$(28)
2750 E$=CHR$(145)
2800 F$=CHR$(147)
2850 DIM M$(37),A$(4),M(12),MU(25),FT(25)
2900 DATA 31,28,31,30,31,30,31,31,30,31,30,31
2950 FOR X=1 TO 12:READM(X):NEXT
3000 RO=π/180
3050 P1=2*π
3100 R1=180/π
3150 PO=π/2
3200 L1=LL(1)
3250 W1=WW(1)
3300 L2=LL(2)
3350 W2=WW(2)
3400 PRINT" DAY,MONTH"
3450 INPUT"";D6,MO:PRINT
3500 PRINT" SOLAR FLUX 70-250"
3550 INPUT"";SF:PRINT
3600 PRINT"A-INDEX:":PRINT
3650 INPUT"";AI
3700 L1=L1*RO
3750 W1=W1*RO
3800 S9=(-0.73+SQR(.73)^2-4*(.0008)*(65-SF)))/(2*.0008)
3850 S9=INT(S9*100)/100
3900 PRINT#1,"DAY= : "D6"  MONTH: "MO" SOLAR-FLUX:
     "SF" SUN-SPOT #: "S9:PRINT#1
3950 IF AI<10 THEN AI$="EXCELLENT"
4000 IF AI=>10 AND AI <= 20 THEN AI$="GOOD"
4050 IF AI>20 AND AI <=25 THEN AI$="FAIR"
4100 IF AI>25 THEN AI$="POOR"
4150 PRINT#1,"A-INDEX:"AI:PRINT#1
4200 PRINT#1,"SIGNAL QUALITY:"AI$:PRINT#1
4250 PRINT#1,Z$"07TIME-UTC"Z$"22TIME-CST"Z$"42 MUF";
     Z$"62 FOT":PRINT#1
4300 L2=L2*RO
4350 W2=W2*RO
4400 FOR T5=1 TO 24
4450 GOSUB 6200
4500 J9=J9+(1.5*LOG(J9)):J9=INT(J9*100)/100
4550 FT(T5)=J9*.85:FT(T5)=INT(FT(T5)*100)/100
4600 MU(T5)=J9
4650 NEXT T5
4700 PRINT#1,Z$"090100";Z$"247PM";Z$"41"MU(24);Z$"60"FT(24)
4750 PRINT#1,Z$"090200";Z$"248PM";Z$"41"MU(1);Z$"60"FT(1)
4800 PRINT#1,Z$"090300";Z$"249PM";Z$"41"MU(2);Z$"60"FT(2)
4850 PRINT#1,Z$"090400";Z$"2410PM";Z$"41"MU(3);Z$"60"FT(3)
4900 PRINT#1,Z$"090500";Z$"2411PM";Z$"41"MU(4);Z$"60"FT(4)
4950 PRINT#1,Z$"090600";Z$"24MIDNIGHT";Z$"41"MU(5);
     Z$"60"FT(5)
5000 PRINT#1,Z$"090700";Z$"241AM";Z$"41"MU(6);Z$"60"FT(6)
5050 PRINT#1,Z$"090800";Z$"242AM";Z$"41"MU(7);Z$"60"FT(7)
5100 PRINT#1,Z$"090900";Z$"243AM";Z$"41"MU(8);Z$"60"FT(8)
5150 PRINT#1,Z$"091000";Z$"244AM";Z$"41"MU(9);Z$"60"FT(9)
5200 PRINT#1,Z$"091100";Z$"245AM";Z$"41"MU(10);Z$"60"FT(10)
5250 PRINT#1,Z$"091200";Z$"246AM";Z$"41"MU(11);Z$"60"FT(11)
5300 PRINT#1,Z$"091300";Z$"247AM";Z$"41"MU(12);Z$"60"FT(12)
5350 PRINT#1,Z$"091400";Z$"248AM";Z$"41"MU(13);Z$"60"FT(13)
5400 PRINT#1,Z$"091500";Z$"249AM";Z$"41"MU(14);Z$"60"FT(14)
5450 PRINT#1,Z$"091600";Z$"2410AM";Z$"41"MU(15);
     Z$"60"FT(15)
5500 PRINT#1,Z$"091700";Z$"2411AM";Z$"41"MU(16);
     Z$"60"FT(16)
5550 PRINT#1,Z$"091800";Z$"24NOON";Z$"41"MU(17);
     Z$"60"FT(17)
5600 PRINT#1,Z$"091900";Z$"241PM";Z$"41"MU(18);Z$"60"FT(18)
5650 PRINT#1,Z$"092000";Z$"242PM";Z$"41"MU(19);Z$"60"FT(19)
5700 PRINT#1,Z$"092100";Z$"243PM";Z$"41"MU(20);Z$"60"FT(20)
5750 PRINT#1,Z$"092200";Z$"244PM";Z$"41"MU(21);Z$"60"FT(21)
5800 PRINT#1,Z$"092300";Z$"245PM";Z$"41"MU(22);Z$"60"FT(22)
5850 PRINT#1,Z$"092400";Z$"246PM";Z$"41"MU(23);Z$"60"FT(23)
5900 PRINT#1:PRINT#1:PRINT#1:PRINT#1
5950 PRINT#1,Z$"34 END-OF-DATA"
6000 PRINT#1:PRINT#1:PRINT#1:PRINT#1
6050 SCNCLR
6100 CLOSE 1
6150 END
6200 K7=SIN(L1)*SIN(L2)+COS(L1)*COS(L2)*COS(W2-W1)
6250 IFK7=>-1THEN6400
6300 K7=-1
6350 GOTO6500
6400 IFK7<=1THEN6500
6450 K7=1
6500 G1=-ATN(K7/SQR(-K7*K7+1))+π/2
6550 K6=1.59*G1
6600 IFK6>=1THEN6700
6650 K6=1
6700 K5=1/K6
6750 J9=100
6800 FORK1=1/(2*K6)TO1-1/(2*K6)STEP0.9999-1/K6
6850 IFK5=1THEN6950
6900 K5=.5
6950 P=SIN(L2)
7000 Q=COS(L2)
7050 A=(SIN(L1)-P*COS(G1))/(Q*SIN(G1))
7100 B=G1*K1
7150 C=P*COS(B)+Q*SIN(B)*A
7200 D=(COS(B)-C*P)/(Q*SQR(1-C^2))
7250 IFD>=-1THEN7400
7300 D=-1
7350 GOTO7500
7400 IFD<=1THEN7500
7450 D=1
7500 D=-ATN(D/SQR(-D*D+1))+π/2
7550 WO=W2+SGN(SIN(W1-W2))*D
7600 IFWO=>OTHEN7700
7650 WO=WO+P1
7700 IFWO<P1THEN7800
7750 WO=WO-P1
7800 IFC=>-1THEN7950
7850 C=-1
7900 GOTO8050
7950 IFC<=1THEN8050
8000 C=1
8050 LO=PO-(-ATN(C/SQR(-C*C+1))+π/2)
8100 Y1=0.0172*(10+(MO-1)*30.4+D6)
8150 Y2=0.409*COS(Y1)
8200 K8=3.82*WO+12+0.13*(SIN(Y1)+1.2*SIN(2*Y1))
8250 K8=K8-12*(1+SGN(K8-24))*SGN(ABS(K8-24))
8300 IFCOS(LO+Y2)>-0.26THEN8800
8350 K9=0
8400 G0=0
8450 M9=2.5*G1*K5
8500 IFM9<=POTHEN8600
8550 M9=PO
8600 M9=SIN(M9)
8650 M9=1+2.5*M9*SQR(M9)
8700 GOTO10050
8800 K9=(-0.26+SIN(Y2)*SIN(LO))/(COS(Y2)*COS(LO)+.001)
8850 K9=12-ATN(K9/SQR(ABS(1-K9*K9)))*7.639437
8900 T=K8-K9/2+12*(1-SGN(K8-K9/2))*SGN(ABS(K8-K9/2))
8950 T4=K8+K9/2-12*(1+SGN(K8+K9/2-24))*SGN(ABS(K8+K9/2-24))
9000 C0=ABS(COS(LO+Y2))
9050 T9=9.7*C0^9.6
9100 IFT9>0.1THEN9200
9150 T9=0.1
9200 M9=2.5*G1*K5
9250 IFM9<=POTHEN9350
9300 M9=PO
9350 M9=SIN(M9)
9400 M9=1+2.5*M9*SQR(M9)
9450 IFT4<TTHEN9600
9500 IF(T5-T)*(T4-T5)>0THEN9650
9550 GOTO10300
9600 IF(T5-T4)*(T-T5)>0THEN10300
9650 T6=T5+12*(1+SGN(T-T5))*SGN(ABS(T-T5))
9700 G9=π*(T6-T)/K9
9750 G8=π*T9/K9
9800 U=(T-T6)/T9
9850 G0=C0*(SIN(G9)+G8*(EXP(U)-COS(G9)))/(1+G8*G8)
9900 G7=C0*(G8*(EXP(-K9/T9)+1))*EXP((K9-24)/2)/(1+G8*G8)
9950 IFG0=>G7THEN10050
10000 G0=G7
10050 G2=(1+S9/250)*M9*SQR(6+58*SQR(G0))
10100 G2=G2*(1-0.1*EXP((K9-24)/3))
10150 G2=G2*(1+(1-SGN(L1)*SGN(L2))*0.1)
10200 G2=G2*(1-0.1*(1+SGN(ABS(SIN(LO))-COS(LO))))
10250 GOTO 10600
10300 T6=T5+12*(1+SGN(T4-T5))*SGN(ABS(T4-T5))
10350 G8=π*T9/K9
10400 U=(T4-T6)/2
10450 U1=-K9/T9
10500 G0=C0*(G8*(EXP(U1)+1))*EXP(U)/(1+G8*G8)
10550 GOTO10050
10600 IFG2>J9THEN10700
10650 J9=G2
10700 NEXTK1
10750 J9=.93*J9
10800 G=1:RETURN
```

Fig. 5. Listing for the Commodore 64/128 MUF/Distance/Propagation Quality generator program.

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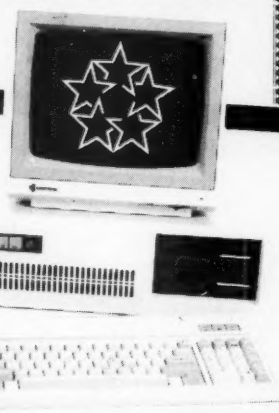

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ultrastar XT

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- 2 DS/DD Floppy Disk Drives
- Turbo Mother Board: 4.77 MHz and 10 MHz (Switchable)
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CW operation can be by either the built-in push button or with an external key or keyer. External speaker and microphone jacks are also provided, and the telescoping antenna is included. The DX Handy also has a top panel S-meter/ output power meter and an effective noise blanker circuit. DX Handy is housed in an attractive gray metal case comparing in size to popular VHF FM handhelds.

Ten meters is coming back strong. With DX Handy all amateurs, novice to extra class, can enjoy the thrill of working handheld DX.

Specifications

General
- Frequency Coverage: Any two 50 KHz segments in the 28.0–29.0 MHz Amateur Band (28.25–28.30 and 28.30–28.35 MHz supplied)
- Frequency Control: VXO provides 50 KHz of continuous tuning with a single crystal
- Frequency Stability: Within ±500 Hz from a cold start
- Antenna: 50 Ohms Unbalanced, BNC connector
- Power Requirement: 8.4–9.0 VDC
  (Included): 6-AA Dry Cells (1.5 volt/cell) = 9.0 VDC
  (Optional): 7-AA NiCads (1.2 Volt/cell) = 8.4 VDC
- Current Drain: Receiving - Approx. 70 mA
  Transmitting - Approx. 620 mA
- Dimensions: (W) 66mm × (H) 39mm × (D) 142mm
- Weight: 710 Grams (1 lb. 9 oz.) with batteries and antenna

Transmitter
- Output Power: 2 Watts at 9.0 VDC
- Emission modes: A3J (USB) and A1 (CW)
- Spurious Emissions: More than 40 dB down

Receiver
- Sensitivity: less than 0.5 uV for 15 dB S/N
- Intermediate Frequency: 11.2735 MHz

Controls and Indicators
- On/Off Volume control Top mounted Potentiometer
- Receiver Incremental Tuning (RIT): Top mounted Potentiometer with center off detent position
- Frequency: Top mounted 50 KHz VXO
- Frequency Range: Top mounted 2-position switch
- Noise Blanker: Top mounted On/Off switch
- S/RF meter: Top mounted S/RF meter
- Built in CW key: Top mounted momentary switch
- External Speaker output: Top mounted 1/16" phone jack
- External Microphone input: Top mounted 1/8" phone jack
- Antenna Connector: Top mounted Female BNC
- Transmit Indicator: Top mounted Transmit LED
- Push-To-Talk: Side mounted momentary switch
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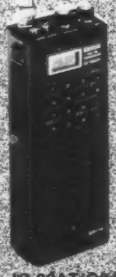

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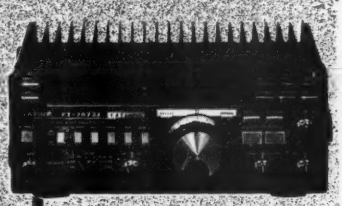

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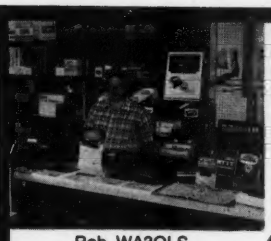

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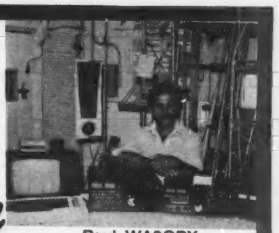

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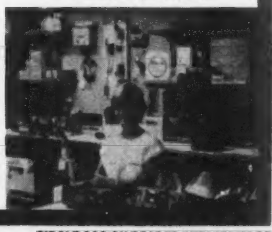

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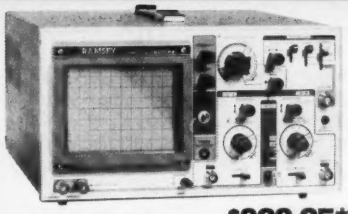

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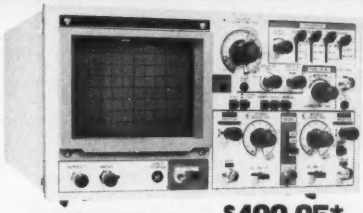

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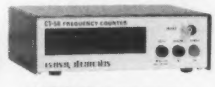

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CIRCUITS

Number 21 on your Feedback card

Great Ideas From Our Readers

Many readers will recognize the revival of this regular feature, which has been absent from the pages of *73* for several years. We welcome brief contributions of circuits. If your idea is published, you will receive a free subscription or a renewal. Clearly indicate that your submission is for this column and not a manuscript for an article.—Ed.

LOW COST REPEATER CONTROLLER

Like most hams, we are cheap. This controller can be built for less than $30. It has only 6 chips excluding the output buffer/ driver, 8 passive components, and 8 latched outputs. It will automatically reset its sequence should a wrong digit be received or an entry window timer elapse.

The decoder for the controller is a SSI202P chip available from Radio Shack for $12.95. It has a binary ouput and all audio filtering and processing is done internally. Other parts of the controller include a sequencer, a digit comparator, a quad NANDgate with Schmitt inputs and an addressable latch.

PREFIX SELECTION:

The "1st, 2nd, 3rd" inputs of the 74LS54 are hard-wired to the appropriate outputs of the 4028 decoder.

OPERATION:

A small audio signal enters the touch-tone chip on pin 9. Should the decoder determine that the audio is a valid touch tone, it will put the binary equivalent on the output bus. Pins 1,18,17,16 then pull data valid high. The binary data will be converted to one of ten with the 4028 chip. The data valid will appear on the clock input of the 4017 sequencer chip. Its "zero" output (idle state) will go inactive (low) starting the 4 second window timer (R1, C1). The "one" output of the sequencer will activate, enabling the first digit comparator (74LS54). Pin 6 will show the results of the comparison, low = match, high = no match. When the tone stops, data valid will go low and a pulse generated by one shot R3,C3 will allow the sequencer to be reset in the event of a bad digit. The binary data will remain on the buss for at least 40ms.

This process will continue until the prefix is properly entered or the window timer times out. On step four of the sequence, pin 13 of the 4093 will enable and the binary data of the last digit will form an address and data bit on the input to the 4099 addressable latch. The LSB of the data will determine if the addressed latch will be set or reset. When the last tone is released the one-shot C3-R3 will enable Pin 12 of the 4093 and tell the 4099 to read its inputs, thus setting or resetting the appropriate latch. This last digit is always determined to be bad and will reset the sequencer so it will be ready for the next function. There is enough propagation delay so that the 4099 will do its job before the reset occurs. Should a false tone initiate a sequence or an operator abort a control function, the sequencer will reset after the window time.

Example, prefix = 123

FUNCTION:

	Set	Reset	
0	1231	123D	The codes
1	1233	1232	come out a
2	1235	1234	little weird,
3	1237	1236	but how much
4	1239	1238	can you expect
5	123•	1230	6 chips to do?
6	123A	123#	
7	123C	123B	

CONSTRUCTION:

The controller is easily built with wire wrap construction on less than four square inches of board. All passive components can be mounted on a single dip header.

PARTS LIST:

1	CD4093
1	10 meg ¼w
1	18 pin ww socket
1	CD4099
1	2.2 meg ¼w
4	16 pin ww socket
1	CD4028
1	33k ¼w
2	14 pin ww socket
1	CD4017
1	2.2 uF
1	16 pin dip header
1	74LS54 / 74LS54
2	0.01 uF
1	SSI202P
1	3.579 mHz crystal
1	1N914 / 1N4148 diode

OPTIONS:

1. A CD4514 can be substituted for the CD4028 so that any of sixteen touch-tone can be included in the prefix. Note: touch-tone 0 = binary A and T.T. D = binary 0.

2. For a four-digit prefix use pin 12 of 74LS54 for strapping 4th digit, connect pin 13 to pin 10 (step 4) of 4107 and connect pin 4 (step 5) of 4017 to pin 13 of 4093.

3. Data valid indicator as shown, LED driver is 74L04 or MPSA13 darlington with 30k base resistor.

4. Output buffers: The CD4099 will drive 2 74LXX or 1 74LSXX chip. Sink or source about 0.8 ma. 74LS04 or darlington transistors can be used to drive small relays or solid state relays.

—Darryl Rowles N1AAQ
Auburn ME 04210

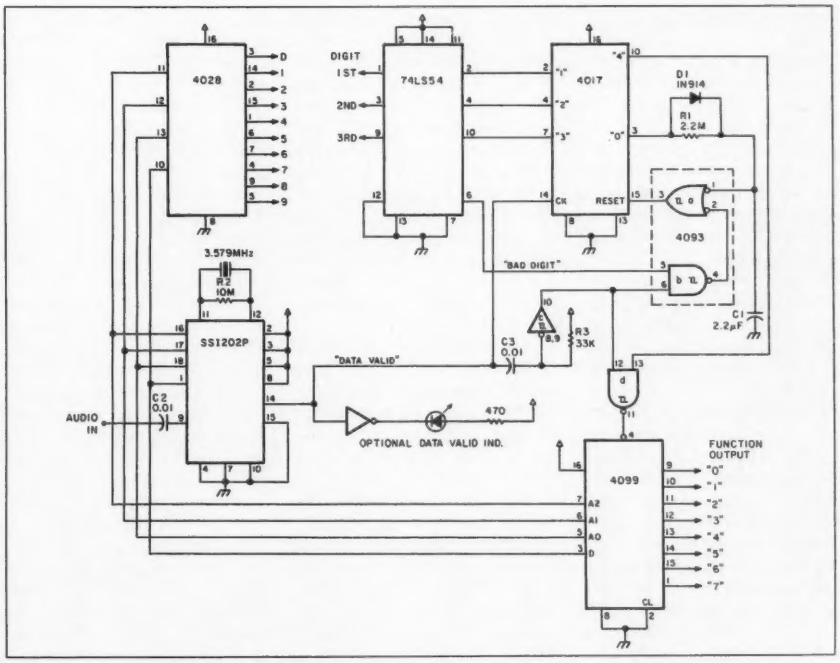

Figure 1. Low cost repeater controller.

ABOVE AND BEYOND

VHF and UHF Operation

Pete Putman KT2B
3353 Fieldstone Dr.
Doylestown PA 18901

WILD, WONDERFUL 6 METERS

We're well on our way into sunspot cycle #22! Only time will tell how intense its effects will be, and we can only speculate on the possibilities for DX on 50 MHz. Some amateurs are already looking into their crystal balls and making some very interesting predictions based on events observed during the 1987 Es season.

Mid-Atlantic VHF Conference: One dire prediction is that 50.110 MHz—the calling frequency for 6 meters—will become a virtual Tower of Babel during the long-haul F2 openings to Europe, Japan, and Africa that are most certain to occur in the next few years. As in the past, voices are calling out for a designated DX window somewhere in the range of 50.080 to 50.200 MHz. And these "seers" have a point, as many countries not heard from before are exercising newly-won privileges on the band. Such countries include Great Britain, Norway, and perhaps even Holland.

With this in mind, I sat in as a guest panelist and represented 73 at the recent Mid-Atlantic VHF Conference, sponsored by the Mt. Airy VHF Radio Club. Also present were Joe Reisert W1JR of Ham Radio, Steve Katz WB2WIK of CQ Magazine, and Bill Tynan W3XO of QST. The topic? A proposal for a 6-meter DX window. The moderator was Rick Connor WB2NPE, long an active VHFer and conversant about 6 meters. Herb Spoonts W3IWU, a longtime veteran on 6, also sat on the panel.

Over 150 persons attended this conference, and most made it a point to sit in on this panel. A variety of comments were heard, and it should come as no surprise that no consensus of any kind was reached! The entire point of this panel was to stimulate the discussion necessary to make an intelligent decision whether or not to have such a calling frequency, and where to have it.

For those readers not familiar with 6m, conditions of enhanced long-haul F2 propagation can be so intense that a mere 3 Watts and a whip antenna will get you across the USA and even into some other countries. But you might have a real hard time working a comparatively weak station from, say, Wales, if a local station is running over 1 kW nearby and desensing your receiver. Witness the weekend of the 1987 June VHF QSO Party, when hundreds of 6-meter stations in the USA ran high power congregated around 50.110 MHz. Stations from as far away as the 5th call area were being heard loud and clear in Great Britain and Portugal, but not vice-versa! Many stateside operators lost out on good DX and rare grid squares.

Power restrictions placed on many European operators compounds the problem. Great Britain stations are limited to a maximum of 100 Watts ERP—equivalent to running 20 Watts into a 7-dB antenna. Not much to work with, yet some operators in both Canada and the US have managed to work hundreds of these low-power stations.

DX Window?

According to my notes, the majority at the meeting favored a DX window of some sort. How to implement it was another story altogether! Many comments hinged on the increased use of CW and the establishment of a CW segment between 50.080 and 50.100 MHz, with US and Canadian stations calling outside this window and working split. Other amateurs suggested setting aside the entire segment from 50.100—50.125 for DX, with a gentlemen's agreement enforcing the window—especially during contests.

Most amateurs present felt that the problem existed only during contest periods, and specifically during the June event. They felt that DX and stateside stations would figure out a way to find a clear frequency if they wanted to contact badly enough. The problem is at its worst during a contest, yet that is precisely the time when you might have the best chance to work the most DX stations. The activity level draws out the DX, especially when conditions are favorable.

The point was raised that Japanese stations raised from the West Coast often use CW for their contacts, owing to the relatively weak signals and strong regional accents. The JA1UT operation to mainland China recently used split-frequency operation with a great deal of success. Another problem raised is that many DX-peditions are severely limited to the frequencies that can be used on 6 meters. Only in some cases do frequencies fall within the proposed window of 50.100–50.125. In others, the only place to go is above 53 MHz, which may be higher than the MUF during an opening!

Conference Outcome

I counted over 40 separate comments on this proposal, and the responses ran the gamut. These are the consenses, however, in brief:

- There is a real need for a DX window, protected from US and Canadian stations.
- Persons making contacts on 50.110 MHz should promptly QSY to another part of the band. This would likely involve split-frequency operation, similar to that in use on 160m, and also common to 40-meter operation during contests.

A few well-versed six-meter operators dissented, saying that a window would close out too many operators. All present, however, felt that hams can enforce a window. Amateurs also asked just what is DX on 6 meters. They pointed out that stations in Florida and the Gulf Coast can work into the Caribbean without much difficulty, but those same stations would be a real DX find for stations in the northeast, midwest, and west!

The issue also came up at the Central States Conference, and I expect there'll be a lot more discussion over the next year or so. I'll try to keep you informed of others' opinions, but be advised that all of this is probably building up to a request to the ARRL Contest Advisory Committee (CAC) to create a DX window for their 3 major contests in January, June and September. As a member of the CQ VHF WPX Committee, I think that a similar rule will be adopted in the near future, based on feedback from participants this past July.

My own opinion? Quite simply: A DX window is an excellent idea during contests, when the band is loaded with stations running lots of power, all parked on or around 50.110 MHz. I don't think it's necessary at any other time since operating skill should enable stateside and DX stations to find each other. If DX stations were allowed to run the power that we are, no window would be needed at all.

More New Products

I recently spoke with two very active amateurs during the Hamarama and Conference. One was Bill Olsen W3HQT who runs Down East Microwave in Troy, Maine. Bill has manufactured a line of loop yagis for several years, and can get you set up on 903, 1296 or 2304 MHz in a hurry! Bill also designs and builds solid-state gain blocks for these bands, with current production models available to run 16 or 32 Watts on 1296 MHz.

Bill also carries the LMW line of transverter kits from England. These kits are based on building blocks, such as transmit and receive mixers, local oscillator (LO) boards, and RX/TX gain stages. I decided to take the plunge and get on 2304 with the LMW kit and housing. It consists of the LMW Universal Local Oscillator (which I found is almost impossible to screw up when finished), a Transmit Mixer with 500-mW output, receive mixer, GaAsFET preamplifier, and 144-MHz i-f amplifier. In addition, you'll need 13.8 VDC to make it all work, and an enclosure to put it all in.

I hope to have this unit up and running by the January Sweepstakes. There are at least six other amateurs in my area active on 13cm. Wiring is fairly critical at this frequency, and SMA connectors are the choice, except at the antenna, where a Type N is employed. LMW also makes these units assembled in a neat little package with a power meter and sequencer for 1296 and 2304. Prices run into the $500 range for a 6-Watt unit on 1296 and 2 Watts on 2304. I've been assured by Bill that 903 models are forthcoming. Send for the catalog at Down East Microwave, Box 2310 RR #1, Troy ME 04987 (207/948-3741).

Another member of the Mt. Airy Club is Dave Mascaro WA3JUF who operates a business called Frontier Microwave. Dave is an accomplished RF designer and a true PackRat, and has come out with a line of microwave amplifiers for 903, 1296, 2304 and even 3456 MHz. These are available in both Class C and Class A (linear) models, with the Class C types typically having more gain. Most of his amplifiers require 24–28 VDC (no problem there) for Class

C operation, while the linear types will typically need both 26 and -5 VDC supplies, the latter used for bias.

All of Dave's designs function in the grounded-base mode and the -5 volt supply is used for emitter bias (similar to cathode bias on a 7289/3CX100). Dave suggests using a 6-volt gel-cell as the bias supply and has done so many times while portable. None of these designs are switchable—you must devise some sort of antenna switching and input switching scheme. Typically you'd drive the output of your 23cm or 13cm mixer directly into the amplifier and use one SPDT relay at the antenna to select the amplifier or receiver. Such a relay should use low-loss connectors and be intended for microwave applications. Type N or SMA types should work, but be careful in your selection. Dow Key Type—60 relays aren't always 50 Ohms at 1296, and look out at 2304!

Dave also makes switched 30-Watt amplifiers for 144 and 220 MHz, both of which have preamplifier options available. I've seen examples of the 1296 and 2304 amplifiers and the workmanship is excellent. They are available in power ranges from 10 mW to 30 Watts on 23 cm, and from 10 mW to 20 Watts on 13 cm. If you are looking for intermediate stages or a medium-power solid-state "brick" for the microwave bands, drop Dave a line at Frontier Microwave, RD1 Box 467, Ottsville PA 18942 (or call in the evenings at 215/795-2648).

"There is a real need for a DX window, protected from US and Canadian stations."

I've also gotten a product announcement from Hi-Spec of Jupiter, Florida, which mentions their new line of cavity assemblies for 2304 MHz. Two designs are offered: The first, Model 13G1, accommodates a single 7289, running from 25–50 Watts at about 10–13dB gain. The Model 13G2 will take two tubes, and runs from 50 to 100 Watts in a 6–13dB configuration, depending on bias. I assume these are just cavity assemblies and you will need to make up a power supply, a bias supply and come up with a blower. Contact Hi-Spec at PO Box 387, Jupiter FL 33468 (305/746-5031).

New Year's Resolutions

I'll close this month by planting a few seeds for 1988. Call them New Year's resolutions if you will, but give these ideas some thought:

(1) Try to run at least one major contest if you've never done it before—just to see what you can work when the bands are hopping.
(2) Try to build at least one item for your VHF/UHF station, whether it be a preamp, sequencer, amplifier, antenna array, or power supply. Keep those hands busy!
(3) Pick up a copy of one of the proceedings from the many VHF/UHF conferences held around the country, such as Central States or Mid Atlantic. Read it. See if something doesn't jog your interest or prompt you to write a letter (or better yet an article!) about that topic. The ARRL is publishing most of these proceedings and the price is reasonable—about $10 each.
(4) Get involved with other VHF/UHF enthusiasts in your area. Why not start up a club if one doesn't already exist? I know of at least two major organizations that came into being in 1987 (North Texas Microwave Society and Midwest VHF Society) as a result of interested hams getting together and trading ideas.
(5) If you've used some piece of VHF or UHF equipment reviewed or advertised in this magazine and have strong opinions about it, write me! I want to hear them.
(6) Use the many propagation beacons that someone has spent considerable expense to get on the air. They're your 24-hour sentry, watching for that elusive 2m opening that might bring VUCC . . . a new state on 1296 . . . DX on six meters.

With that last sentence, we've come full circle. I'll be looking for many of you during the January VHF Sweepstakes. Good luck, best DX, and see you next month. Above and Beyond!

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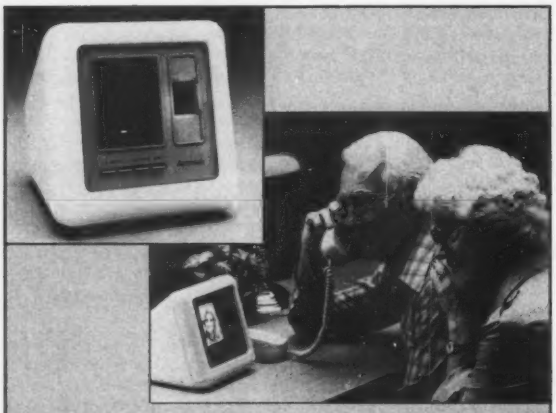
NEW PRODUCTS

Compiled by Rebecca Niemela



The VisiTel from Mitsubishi's Visual Telecom Division. (2 photos)

MITSUBISHI

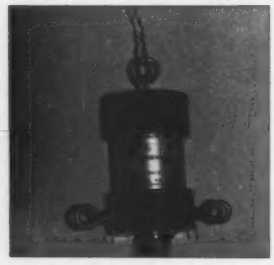
Mitsubishi and its Visual Telecom Division announced the introduction of the **Mitsubishi VisiTel* Visual Telephone Display**, the first still-frame visual telephone specifically designed for home use.

The practical and affordable ($399 suggested retail price) VisiTel puts exciting new picture phone technology within the reach of the average consumer. The unit features a built-in video camera and a 4.5 inch (diagonally measured) monitor, enabling the user to send and receive freezer-frame black and white "video snapshots" over standard telephone lines.

The VisiTel works in tandem with any home telephone equipped with a modular phone plug. As easy to install as an answering machine, the unit plugs into a regular AC outlet and home phone jack, and requires no special wiring or phone line.

For more information contact Mitsubishi Visual Telecom Division, 3350 Scott Blvd, Bldg. 49, Santa Clara CA 95054 (408/970-9555). Or circle Reader Service Card #201.

* "VisiTel" is a trademark of Mitsubishi Visual Telecom Division.



Antenna balun from Antenna Systems.

ANTENNA SYSTEMS

Antenna Systems has introduced a new **antenna balun** which includes a feature not found on any other balun. This feature is called Antenna Feedline Protectorcoptrt. Antenna Feedline Protector© prevents your coaxial cable from breaking off your antenna by removing the strain from the connector. It does this through a specially designed strain relief.

The K2RAG Balun covers the frequency range ofrom 1.8 to 32 MHz, is made of rugged ABS plastic and includes all stainless steel fittings. It handles 2KW PEP transmitting power. There are two models available. Also included as standard features are static protection, center fed support hanger and low weight. K2RAG Baluns are also available as part of fully-assembled dipoles and end-fed antennas for each of the popular HF bands. K2RAG antennas are precut for the CW portion of the band and are also marked for the phone portion.

For more information write to Antenna Systems Inc., 14465 SW Hazelhill Drive, Tigard OR 97224 (503/684-5350) or circle Reader Service Card #213.

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SIMPSON ELECTRONICS

A new 8-page, 2-color catalog featuring low-cost test equipment was released by the Mercer Electronics Division of Simpson Electronic Company.

The catalog features the company's full line of products, including its recently announced new multifunction frequency counters and 2 MHz sweep/function generator. Other products featured include 3½ and 4½ digit hand-held DMMs; a Volt-Ohm-Ammeter; a high accuracy, full range capacitance tester; and a variety of other digital instruments and probes.

The product line is carried in stock at electrical and electronic distributors nationwide.

This catalog is available at no charge from your electronic distributor or by contacting Mercer Electronics, 859 Dundee Avenue, Elgin IL 60120-3090 (312/697-2260) or circle Reader Service Card #206.

CONTACT EAST

Contact East's latest catalog contains many new and innovative items for service engineers, manufacturing engineers, technicians, and electronic hobbyists. A full section of test instruments; the latest in static and contamination protection; inspection aids; data and telecommunication equipment; electronic adhesives; soldering supplies; Contact East's exclusive line of tool kits and an extensive section devoted to precision hand tools are just some of the products featured in this issue.

To receive your free full-color copy, plus a complementary year's subscription, write to Contact East, P.O. Box 786, North Andover MA 01845; 617-682-2000. Or circle Reader Service Card #207.

ICOM's UX-14 Converter.

NEWS FROM ICOM

The **UX-14 Converter** enables you to adapt a CI-IV system to a CI-V system. This allows the transceiver to be computer controlled, or for satellite operations using the CT-16 Satellite Interface Unit. The following radios are equipped with a CI-IV port and can be converted for CI-V use with the UX-14: IC-R71A, IC-271A, IC-271H, IC-471A, IC-471H, IC-751, IC-751A and IC-1271A. Suggested price is $73.

To complement the growing activity on 220MHz, ICOM now has a 220MHz repeater available, the **RP-2210**. With frequency coverage from 216-236 MHz, selectable CTCSS/Carrier squelch operating system, and 25 watts RF output power, DTMF control and continuous duty cycle. The RP-2210 is a great way to get out of the mainstream activity. Suggested price is $1500.

This mini-sized speaker mic is big on audio. . . the **HM-46** for top panel connection on the IC-2AT, IC-02AT, IC-3AT, IC-03AT, IC-4AT and IC-04AT and the HM-46L right angle connection speaker mic for the Micro series. Both the HM-46 and HM-46L have a swivel clip on the back to easily clip on your lapel or collar. Suggested price is $30.

For information on all of these ICOM products, contact ICOM America, Inc., 2380-116 Ave. N.E., Bellevue WA 98009 (206/454-8155).

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By Bob Grove
WA4PYQ

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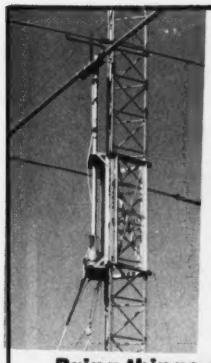

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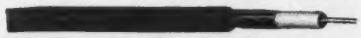

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1450 RG174/U 50 ohm .100" od mil spec	*.14*

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Converts Your HT to a Powerful Mobile Unit

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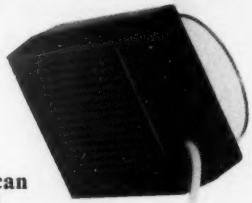
CIRCLE 151 ON READER SERVICE CARD

ULTIMATE MOBILE SPEAKER!



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Finally a speaker you can put where YOU want it!
Place it near your ear for fine armchair copy, even in your car! **$29.95**
Specially designed suction cups hold for over two weeks yet remove easily for "out of sight" storage and added security.

High efficiency speaker and either mini or sub-mini phone plug for connection to rig. (Specify connector when ordering)

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Give your receiver a hearing aid! Wideband preamps for both base and mobile use. Great for scopes and counters too! Prices start at only $29.95!

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AND COMPUTER SHOW

Build your next vacation around the southland's most popular Hamfest, at the hub of the greatest entertainment and activity center in the east.

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★ Kennedy Space Center ★ Epcot
★ Daytona Beach ★ Church Street Station ★ Busch Gardens
★ Cypress Gardens ★ Silver Spgs

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ARRL
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MARCH 11-13, 1988
at ORLANDO'S
EXPO-CENTRE

UPGRADE! Volunteer Examinations by CAVEC • SUNDAY (March 13)
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MAR. 8-10, 1991 ★ MAR. 14-16, 1992

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Dept. QST, P.O. Box 547811 • Orlando, Florida 32854-7811
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CIRCLE 96 ON READER SERVICE CARD

Number 24 on your Feedback card

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QSLs To Order. Variety of styles, colors, card stock. W4BPD QSLs, PO Drawer DX, Cordova SC 29039. BNB260

The DX'ers Magazine Up-to-date, informative, interesting. Compiled and edited by Gus Browning W4BPD, DX-CC Honor Roll Certificate 2–4. Send for *free* sample and subscription information today. PO Drawer DX, Cordova SC 29039. BNB261

Xerox MemoryWriter—parts, assemblies, boards, manuals. Free help with service problems. W6NTH, Box 250, Benton AR 72015 501-776-0920. BNB404

Learn Code on your IBM PC (or compatible), Commodore C-64/128, or 512K Macintosh. CODE-PRO takes you from no knowledge to proficient copy. Specify computer. $10 plus $2 p&h. Trio Technology, Dept. 861, PO Box 402, Palm Bay FL 32906. BNB490

Post Card QSL Kit Converts post cards, photos to QSLs! Stamp brings circular K-K Labels, PO Box 412, Troy NY 12181-0412. BNB498

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2.4 KHz AM Demodulator with 8 bit A-D and buffer. Copy WEFAX From GOES SATELLITES or APT From N0AA POLAR ORBITING SATELLITES. Created for use with Elmer Schwittek's Multifax 2.0 program. Order #206-KIT $49.95 or assembled and tested board Order #206-ASY $69.95. Add $2.50 Shipping per order. A&A Engineering, 2521 W. LaPalma, Unit K, Anaheim CA 92801 (714/952-2114). BNB531

Ham Radio Repair, all makes, all models. Robert Hall Electronics, PO Box 8363, San Francisco CA 94128 (408)729-8200. BNB558

SB-220 Owners!—Enhance performance—add new features. 11 step-by-step mods which include: tuned-input 6- and 160-meter operation, heavy-duty power supply mods, full QSK operation, solid-state bias control, and many more. Source of parts included. One time 50% rebate for new mods submitted and two free updates. 10 pages of tech info on the 3-500Z. Order today—$10 per copy plus $1 postage. SASE for info. Bob Kozlarek WA2SQQ, 69 Memorial Place, Elmwood Park NJ 07407. BNB581

Commodore Repairs. We are the largest Authorized Service Center in the country and we repair your Commodore computer within days. (our prices are low; eg. C64-$39.95 complete) ....."THE COMMODORE DIAGNOSTICIAN", an invaluable double-sided laminated guide for fixing your C64/1541 drive. It diagnoses 72 variables and tells you what chips are faulty. $6.95 plus $1.00 postage ... C-64 Power Suply $27.95 .... VISA/MC .....Call Toll Free 1-800-248-2983 (outside NY) or 914-356-3131. Kasara Microsystems, Inc., 38 Murray Hill Drive, Spring Valley NY 10977. BNB587

Wanted: Lafayette PrivaCom 3C, 525, 625, or GE 5813B. RADIO, 2053 Mohave Dr., Dayton OH 45431. BNB589

MARCO: Medical Amateur Radio Council, operates daily and Sunday nets. Medically oriented amateurs (physicians, dentists, veterinarians, nurses, therapists, etc.) invited to join. For information, wrtie MARCO, Box 73's, Acme, PA 15610. BNB612

Wanted. Drake R7A Receiver Tony Ficarra, 144 Gladstone Avenue, Wollongong, NSW, Australia 2500, Phone (042) 29 2573. BNB615.

DX Adventure on Monserrat only $300/week. Details: Chod Harris VP2ML Box 4881-7, Santa Rosa, CA 95402. BNB618

Superfast Morse Code Supereasy. Subliminal cassette. $10. Learn Morse Code in 1 Hour. Amazing new supereasy technique. $10. Both $17. Moneyback guarantee. Free catalog: SASE. Bahr, Dept. 73-8, 2549 Temple, Palmbay FL 32905. BNB624

Homebrew Projects List. SASE WB2EUF, Box 708, East, Hampton, NY 11937. BNB626.

Dead Battery Pack??? NiCds/ Inserts / Rebuilding. AA $1.60 (W/Tabs $1.75), 2/3AA 270mAh $1.95, 2/3AF 450mAh $2.45, Replacement inserts, less wires/plugs; ICOM BP2 $17.95, BP3 (original) $16.95, BP5 $23.95, Kenwood TR 2400 $18.95, PB25 $22.95, PB25H/26 $24.95, Tempo; S1/270mAh $19.95, S1,2,4,5 /450mAh $22.95, Azden 300 $18.95. Ten-Tec 2991 $24.95, Santec 144 (8N 500AA) w/plug $19.95 Others, Info/rebuild quotes, SASE. In PA add 6%. Add $2 S and H/order. Cunard Associates, R.D. 6 Box 104, Bedford PA 15522. BNB628

Antenna Traps designed quickly and accurately with your computer. Send $10 for APPLE or IBM-PC program disk and manual, SASE for more information. W1HUE, 119-7 Buckland St., Plantsville CT 06479. BNB630

Back Issues 73 Rare Price Sale. 1977 to 1986. Each twelve issue volume costs $50 plus $3 postage. Send check or money order to A.E. Fant, WB5WAF/DA1FT, Schweinfurt American JHS, APO NY NY 09033. Hurry, I need the space. BNB634

QSLs, QSLs, Rusprint QSLs, Quantities of 100, 200, 300 or more. Full color Old Glory and Cartoon. Also Parchment, Golden Eagle, and others. SASE appreciated. Rusprint, Rte 1, Box 363-73, Spring Hill KS 66083. BNB643

Attention!!! Any amateur radio operators interested in forming a new type of amateur radio club. For information please send $2 to cover postage to KA3RET P.O. Box 96, Uniontown, PA 15401. BNB645

R-390A Receiver: $115, electronically complete, reparable (Government-removed meters, operation unaffected). R-390A parts: Info SASE. Professional quality TS-352 Voltohm/Mutimeter, AC-DC, with leads, manual: $12.50. Mint military-spec pull out 12AT7, 6BA6, 6BA6, 6AG5, 6AL5: $10/six. CPRC-26 Infantry Manpack Radio, 6 meter FM, Receiver-Transmitter sections, cabinet, antenna, crystal, handset: $22.50, $42.50/pair. H-251 Military Communications Headphones: $7.50. Add $4.50/piece shipping ($9 maximum), except R-390A shipped collect. Baytronics, Box 591, Sandusky OH 44870. BNB649

New Quick Charge"AA" NiCds Ten for $11.00 plus shipping. "AAA" NiCds just $1.65 each. "C" or "D" size NiCds just $3.00 each. Universal NiCd Charger just $9.99 Amphenol PL-259 Connectors just 80 cents each. R. Richard, 1787 Village Green Dr., Clairton PA 15025; 412-655-7494. BNB650

Amateur Radio Stamps for collectors. Israel $5. Luxembourg $1.50. Send SASE for complete list to Phil Sager WB4FDT, 126 Whiting Lane, West Hartford CT 06119. BNB651

Kenwood TS940 Owners: Easy to install EPROM makes tuning in signals simple with an SSB/CW slow tuning rate of 2kHz. Faster turning gives faster tuning rate. $25 Giehl Electronics, PO Box 18335, Cincinnati OH 45218. BNB655

APPLE Owners Keep track of your DX contacts. This program files, sorts, alphabetizes and counts your DX contacts for each band. Need disk drive. $22. Scott Newpower, 673 Parkview Ave., St. Paul MN 55117. BNB657

Communications Receivers: The Vacuum Tube Era. Book covers history, specs on 700 receivers, 51 companies, 112 photos. $14.95 plus $2 P/S. Details SASE. RSM Communications, Dept 73, Box 218, Norwood MA 02062. BNB658

Commodore C-128 Radio/Electronics and Engineering Design software. Not available through any other source. Over 65 Design Programs. User Friendly Send $20 for 2 disks or SASE for information to Tri-County Amateur Radio Club, c/o KA4ZAY, P.O. Box 680741, Miami FL 33168-0741. BNB659

TEN-TEC ARGONAUT WANTED State s/n, condition, accessories. Rod Sharp N5NM, Box 2169, Santa Fe NM 87504; 505-988-2305. BNB660

ATLAS 350-XL WANTED State s/n, condition, accessories. Rod Sharp N5NM, Box 2169, Santa Fe NM 87504; 505-988-2305. BNB661

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PROPAGATION

Jim Gray W1XU

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7A	14	14	14	14
ARGENTINA	21	14	14	7A	7	7	7A	14	14A	21A	21A	21
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	14	14	7A	7	7	7	7A	14	14	14	21	21
ENGLAND	14	7A	7	7	7	7A	14	14	14	14A	14A	14A
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21
INDIA	14	14	7B	7B	7B	7B	7A	14	14	14	14	14
JAPAN	14	14	14B	7B	7B	7B	7B	14B	14	14	14	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14A	14
PHILIPPINES	14	14	14B	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14	14	7A	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	14	14	14	14A	14A	14	14
U. S. S. R.	7A	7	7	7	7	7B	14	14	14A	14A	14	14
WEST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A

CENTRAL UNITED STATES TO:

ALASKA	14	14	14	7	7	7	7	7	7A	14	14	14
ARGENTINA	21	14A	14	7A	7	7	7A	14	14A	21A	21A	21
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14A	21A	21
ENGLAND	14	7A	7	7	7	7	7A	14	14	14	14A	14
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21
INDIA	14	14	7A	7B	7B	7B	7B	7A	14	14	14	14
JAPAN	14	14	14	7B	7B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7	7	7	7	7	7	14	14	14	14
PHILIPPINES	14	14	14	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14	14	14	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	7B	14	14	14	14A	14	14
U. S. S. R.	7A	7	7	7	7	7B	14B	14	14A	14	14	14

WESTERN UNITED STATES TO:

ALASKA	14	14	7A	7	7	7	7	7	14	14	14	14
ARGENTINA	21	14A	14	14	7	7	7	14	21	21A	21A	21
AUSTRALIA	21A	14A	14	14	7A	7A	7	7	7	7B	14	21
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14	21A	21
ENGLAND	14	7A	7	7	7	7	7B	7A	14	14	14	14
HAWAII	21A	14A	14	14	7A	7	7	7	14	14	21	21
INDIA	14	14	14	7A	7B	7B	7B	7A	14	14	14	14
JAPAN	14A	14A	14	14	14B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14A	14A
PHILIPPINES	14A	14	14	14	14B	7B	7B	14B	14	14	14	14
PUERTO RICO	14A	14	7A	7	7	7	7	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	7B	7B	14	14	14A	14	14
U. S. S. R.	7B	7B	7	7	7	7	7B	14B	14	14	14	14
EAST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A

A = Next higher frequency may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

NOTE THAT MIGHT HAVE LETTER NOW COMES FIRST.

Solar flux has increased from the low levels of 1985-86 to moderate levels in 1986-87. With this upward trend, greatly improved DX is likely on the 10- and 15-meter bands this year. January is not starting with a very promising first week or ten days, when HF propagation is likely to vary from good to poor. Beginning about the 10th, conditions are likely to improve and hold good until about the 17th. From the 19th or 20th through about the 27th, expect some geomagnetic upsets, up to storm levels at times, during this period. Although HF may well range to very poor, outstanding VHF and UHF openings are possible during this period. Expect the full effect on the 22nd, 23rd, and 24th. Fair conditions on the HF bands should return for the last five or six days of the month. Follow the charts for the general outlook, but tune in WWV for their hourly propagation reports, and listen to the ARRL propagation bulletins for late-breaking events. As always, keep tuned for other possible geophysical effects to accompany magnetic storm levels.

JANUARY

SUN	MON	TUE	WED	THU	FRI	SAT
					1 F–P	2 P
3 P–F	4 F	5 F	6 F–P	7 P	8 P–F	9 F–G
10 G	11 G	12 G	13 G	14 G	15 G–F	16 F
17 G	18 G	19 F	20 F–P	21 U	22 U	23 U
24 U 31 G	25 P	26 F	27 F–G	28 F	29 F	30 F–G

BARTER 'N' BUY

from page 67

New Antenna Design Delivers 30 dB Gain Over A Dipole On 80 through 10 Meters. Brochure $1. Complete plans...$5. Postpaid. R. Christie KR2F, P.O. Box 69, Queens Village STN., Jamaica NY 11428. BNB663

Wanted: Multi-Band CW XCVR, Must have VFO and operators manual. F. Baldaug, 322 N. Beech Road, Osceola IN 46561. BNB665

"Hamlog" Computer Programs 17 modules. Full features. auto-logs, 7-band WAS/DXXCC. Apple $19.95. IBM, Kaypro, Tandy, C-128 $24.95. KA1AWH, PB 2015, Peabody MA 01960. BNB666

New Washington AM SSB CB With "Extras" $150. New Lorad Hi-Band 80 Channel 25 watt digital transceiver $200. R.D. Carter, P.O. Box 418, Vass NC 28394. BNB667

Real-Time HF WEFAX Maps on a dot matrix printer. Available for Commodore, IBM, Apple and Atari. See March 86 QST Magazine for circuit details. Kit $28.15, Assembled $39.95. Software - Apple, Atari, and Commodore $10.00. IBM - $15.00 plus $2.50 shipping. For info SASE (Large) to: A and A Engineering, 2521 W. La Palma #K, Anaheim CA 92801. BNB668

Smart Battery Charger for gell-cells or lead acid batteries, by Warren Dion W1BBH. See June 87 QST Magazine for circuit details. Complete kit, nothing else to buy, only $49.95 plus $3.50 s/h. Order #150-KIT. A and A Engineering, 2521 W. La Palma, Unit K, Anaheim CA 92801. BNB669

For Sale Two meter 35 ASR with paper winders one model 28 ASR radio set TRC-8, WA4SGW, 919-488-0682. BNB670

I Pay Cash for new and used vacuum tubes, especially vintage and transmitting types. I also buy vintage audio equipment by Western Electric, Altec, McIntosh, Marantz, Westrex, etc. Randy Nachtrieb WA6GJA, 6392 Park Ave., Garden Grove CA 92645; 714-897-9351. BNB671

K1BV DX Awards Directory Complete rules for over 680 certificates 170 pages, $14 postpaid. Ted Melinosky, 525 Foster St., South Windsor CT 06074-2936. BNB672

Customized Buttons: Name and Call or Picture on button or Keychain $3.50 each P.P. N8GXZ, 303 W. Marshall Road, McDonald OH 44437. BNB674

QSLs And RUBBER STAMPS TOP QUALITY! States, World Maps, USA, Key, Shuttle, Globe QSLs. Report Form Rubber Stamps. More! Samples $1 (Refundable With Order). Ebbert Graphics D-7, Box 70, Westerville OH 43081. BNB675

H.T. HOLDER Give your H.T. a safe resting place. This unit is made with a wood base which is slotted for a metal plate that attaches to the belt clip on your radio. Very attractive design. Fits all sizes and models. Prevents radios from falling off tables $9.95. Barry Groupp, 21 Mountain View Ave., Pearl River NY 10965; 914-735-7630. BNB680

Soldering Station and Tools European and American. Free catalog. Robert W. Mink Import-Export, Box 6437S, Fair Haven NJ 07704. 201-758-8388. BNB682

ROSS $$$ USED January SPECIALS: Kenwood TS-830S/W YG-455c $769.90, TS-830S/W-YG-455c $769.90, TS-700A $309.00 Yaesu FC-757AT $209.90, FT-2700RH $399.90, FT-ONE $1099.90, FT-980 $989.90 ETO 374A $1795.90, 76 $1299.90 Phone or send SASE for USED ITEMS LIST. Over 8,777 NEW ham items in stock. MENTION AD. Prices cash, FOB Preston. We close at 2:00 Saturdays and Mondays. Ross Distributing Company, 78 South State, Preston ID 83263; 208-852-0830. P.O. Box 234. BNB683

ROSS $$$ NEW SPECIALS: (January only): Kenwood TM-221A $354.90, TS-940S $1789.90, TS-440S $929.90, ICOM IC-761 $2129.90, IC-28A $399.90, IC-U2AT. $269.90, YAesu FT-980 $1299.90, FT-2700RH $489.90, FT-270RH $329.00, FRG-7700 $399.90, All L.T.O. Phone or send SASE for Pricing immediate shipment. MENTION AD. Prices cash, F.O.B. Preston. We CLOSE at 2:00 Saturdays and Mondays. Ross Distributing Company, 78 South Sate, Preston ID 83263; 208-852-0830, P.O. Box 234. BNB684

UNSUAL OPPORTUNITY Small electro-magnetic mfg. company in rural west central New Jersey (15 employees) is looking for genial workaholic with driving desire to learn all aspects of business, including design, testing and inventing. Degrees not required nor necessarily advantageous. Mature persons in good health gladly considered. Potential limited only by ability and ambition. Send resume to Magnetics and Controls, Inc., P.O. Box 127, Rosemont NJ 08556. BNB685

XEROX 800 Electronic Typing System technical Information or schematics needed. Terry Thompson, Box 935, Dania FL 33004-0935; 305-920-1909. BNB687

QEP's CHRISTMAS SALE

A FREE Gift to anyone who orders BELDEN or AMPHENOL products during November or December.

- BELDEN 9913 low-loss
  500 ft Roll $185.00 or 39¢/ft.
- BELDEN 8214 (foam)
  500 ft Roll $150.00 or 33¢/ft.
- BELDEN 8267 RG-213
  500 ft Roll $185.00 or 39¢/ft.
- BELDEN 8268 RG-214 silver 1.35/ft.

AMPHENOL SPECIALS

PL-259 silver (mica filled)	$1.25
UG-21D 'N' male cable end	2.75
UG-21D 'N' (fitted for 9913)	3.50
UG-23D 'N' female cable end	3.95
UG-29A 'N' Barrel (jack-jack)	4.50
UG-57B 'N' Barrel (plug-plug)	5.20
UG-58A 'N' Chassis receptacle	3.50
UG-83U 'N' Plug to UHF adaptor	8.00

Copper-clad 14 ga. (7x22)
7¢ a foot (any length)
Identical to Belden 8000

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JGAR – PISTOL

Specifications
Gain: 4.75 DB
Multiplication Factor: 12.Times
Power Rating: 2000 CW, 4000 PEP
Height: 10 Feet
Weight: 8.0 Lbs.
Materials: Anodized 6063T-6 Aircraft Aluminum Tubing
Requires 1 Coaxial Cable for Hook-up

JO GUNN Antennas

JGAR – HILLBILLY

Specifications
Gain: Horizontal - 5.25 DB, Vertical - 4.75 DB
Multiplication Factors: Horizontal - 17 Times Vertical - 15 Times
Horz. to Vert. Separation: 20-25 DB
Power Rating: 2000 CW, 4000 PEP
Height: 11 Feet
Weight: 10 Lbs.
Materials: Anodized 6063T-6 Aircraft Aluminum Tubing
Requires 2 Separate Coaxial Cables for Hook-up

NEW JO GUNN AUDIO-FLEX COAX NOW AVAILABLE FOR ANTENNAS

Call or Send $2.00 for Complete Catalog and Pricing of Antennas. ($2.00 Refundable on 1 st Order.)

DEALER INQUIRES, PLEASE CALL

CIRCLE 234 ON READER SERVICE CARD

Above and Beyond
AR2002

PROFESSIONAL MONITOR RECEIVER

25 – 550 MHz
800 – 1300 MHz

Specifications:

Receiving mode – Narrow band FM, Wide band FM & AM
Receiver circuit – Microprocessor controlled PLL Frequency synthesized superheterodyne type with high-level doubled balanced mixer
Receiver IF – 750MHz, 45.03MHz, 5.5 MHz (WFM) and 455kHz (NFM & AM)
Sensitivity – NFM – 0.35 uV (12dB SINAD)
WFM – 1.00 uV (12dB SINAD)
AM – 1.00 uV (10dB S/N)
Selectivity – NFM – ±7.5kHz @ 6dB
±20kHz @ 70dB
WFM – ±50kHz @ 6dB
±250kHz @ 60dB
AM – ±5.0kHz @ 6dB
±10kHz @ 70dB
Number of memory channel – 20 channels
Scan rate – 5 channels per second
Search rate – 6 seconds per MHz
Antenna connector – Standard BNC type, 50-ohm
Audio output power – 1 watt at less than 10% THD
Power requirement – 12 to 14Vdc at 300 to 500mA
Size and weight – 5.4"W x 3.15"H x 7.88"D, 2.6 lbs.

Options
Cradled mobile mounting bracket
Trunk or mobile antenna with 12 ft cable
Discone base antenna with 50 ft cable
RS-232C interface unit

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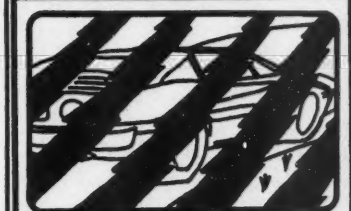

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GREETINGS AND HAPPY NEW YEAR

Hopefully 1988 will be as good a year for the ATV modes as last year was. '87 was highlighted by some good DX openings; the flight of a helium-filled balloon carrying ATV (WB8ELK); progress on building ATV repeaters and remote transmitters; the release of the new North American Repeater Directory; new international SSTV nets; developments in FAX; a new awareness of picking up video TV signals from foreign satellites; a lot of public service projects using FSTV; and better organization and recognition by ATVers through the USATVS organization. New gear is also on the marketplace and the popularity of FM-TV mode interest grew steadily.

What do we have to look forward to with Ham-TV in 1988? More discussions about a Fast Scan Television "Space Shuttle" or "Space Station" project will be held between ARRL, AMSAT, NASA (JSC ARC) and the USATVS. The Spec-Com Journal covered in detail a proposal by N9AB of Ivanhoe IL in the Sept/Oct and November issues (Volume 17, Nos. 8 and 9). The study proposal was incomplete with questionable calculations and assumptions. We need to hear from the ATV community with ideas and proposals on an "ATV in Space" project. Please direct your thoughts to: USATVS organization, through my address or via Bruce Brown WA9GVK/4 at 5597 Seminary Road, 2214-S, Falls Church VA 22041. As NASA's Space/SSTVer Astronaut Dr. Tony England W0ORE said at the September Fall Peoria Superfest and ATV Conference: "It needs a champion"! ATVers need to submit ideas and proposals through the League and/or the USATVS.

Back issues of the two Spec-Com issues and complete copy of the uncopyrighted N9AB proposal are available from the Membership Services Dept. at the USATVS (PO Box H, Lowden IA 52255). Send $5 to cover cost of the issues, copying charges and mailing. A special videotape addendum is available from Henry B. Ruth KB9FO in Des Plaines IL.

Videotape Exchange

Speaking of videotapes, we started an exciting new Ham-TV videocassette Pen-Pal project back in December called "Hello From America!". The December issue of Spec-Com gives details of a contest-type home videotape submission entry of no longer than 5 minutes per person to say "hello" and "show the shack" to foreign ATVers in the European ATV Working Group! Send a SASE for more details. I have worked with several foreign ATV groups in England, Scotland, Germany, New Zealand, Japan, and Australia on swapping VHS VCR tapes. Dr. John Fox WB2LLB/4 has been reconverting these invaluable productions from French SECAM or English PAL to good ol' American NTSC. We have established quite a library of exchanges. It is really lots of fun to "Pen-Pal" (CAM-Pal?) information about one another via a VCR. You don't even have to be on ATV to enjoy such exchanges! The received tapes are then duped and forwarded and played by many ATV groups either via simplex or on repeater systems for all to watch!

Remote-Controlled Air-Mobile ATV!

The AAAS ATV Club in Arizona sent us some nifty pictures of their large remote-controlled model airplane that carried a Sony B/W camera under the belly of the aircraft and a horizontally-polarized, omni-directional "egg-beater"-type antenna that was mounted on top of the cabin of the vehicle. It transmitted live TV pictures from the airplane while in flight and the results were videotaped on the ground. This all took place and was shown at the fall S.W. ARRL Convention in Scottsdale. A complete write-up with several photos is in the December '87 issue of Spec-Com. Way to go AAAS!

We also welcome the new appointment of Dwight Johnson WA7TSD as the new Arizona USATVS State Section Manager. He replaces the faithful reporting service of Bill Munsil N7AOU.

PATC Chicago ATV Repeater Project

Good news from Chicago! The ATV Repeater project, sponsored by Henry Ruh KB9FO and the Peacock ATV Club, is back on again after an NBC network strike halted access to further construction and testing of key transmitter and receiver sites within the Windy City. The strike broke down toward the end of October. Unfortunately, NBC will possibly lay off some 500 network positions in 1988, and it appears that GE is cutting things bare to the bone. Work continues both at the Merchandise Mart (Henry has been granted access privileges) and at the Hancock building as a possible transmitter site. New 10-GHz link equipment has been donated, and the PATC now has 14 paid-up members. All 14 have been given access rights to the already online ATV Weather Radar Remote Transmitter. The USATVS recently sent Henry a frequency coordination approval from a very-slow-to-act Illinois UHF frequency coordinator. The USATVS is a recognized frequency coordinator for ATVers and has been petitioning the ARRL and the FCC to take action against frequency coordinators who have conflict of interests or who refuse to honor the League's band plans, which they are supposed to be protecting. So far there has been little response from the League.

Keep up the good work Henry and crew!

Photo A. Ron Cohen K3ZKO and his superb ATV shack.

Uncoordinated Coordinators?

A strange new radar-type pulse is invading the Washington, DC, area Fast-Scan band around 439.25 MHz. Interference problems such as this must be reported to the FCC and in the Washington, DC, case, investigators are now on the scene. Poor frequency coordination, resulting in even more QRM to ATVers is also a growing threat to ATVers and other mode users on UHF, especially on the 70-cm band. One such example is Chicago, where the frequency coordinator for UHF in Illinois is said to have admitted to over 60 repeater links or hidden (unpublished) operator usages placed on the lower 421-MHz part of the band where an ATV repeater output is supposed to operate. These placements violate even the ARRL band plan. When I wrote to David Sumner of the League about the problem, the only reply that came back was that the League can not do anything on this matter since they do not control or sponsor it. My question then is: "Who coordinates the coordinators?"

Some states are joining a larger council, which will hopefully resolve some of these issues. Other states have no such oversight authority. If a frequency coordinator goes astray, who removes or corrects them? No one, not even the FCC, seems to want to act on this question. Pressure must be brought to the League on this matter so that, in time, and with enough complaints, someone is bound to have to answer to someone else. There must be a system of checks and balances to function properly. It's basic government and very good business sense.

It is vitally important for all ATVers to log and report known interference problems. Report it to the League and the USATVS. The USATVS continues to work with these coordinators in getting the message across that ATVers have rights, too, and will speak up

when they are violated! ATVers must be represented at all VUAC and other committee meetings when discussing or deciding any frequency matter that may affect FSTV operations. To date, this just hasn't happened very much except for a few SSB, AMSAT and packet operators who claim to be ATVers as well. Things are changing and ATVers are finally getting better organized!

WB8ELK Balloon Recovered

Bill Brown WB8ELK reports that the helium-filled balloon, carrying ATV and 2-meter gear, that was launched and flew to 100,000 feet last August, has been recovered! An area farmer about 30 miles from the Findlay OH launch site, was harvesting his cornfield when he noticed a white styrofoam package and buried balloon near his harvester. The return address allowed the farmer to contact Bill and crew and, at last, "all was saved!" All gear checked out in operating condition.

What is next on the agenda for Crazy Bill and gang? An "across-the-country flight" leading to an eventual "around-the-world" balloon flight to carry ATV and radio communications, says Bill! Planning is already underway for a California-to-Eastern Midwest excursion sometime in 1988.

75-Meter ATV Net

Check out WB8ELK's plans and details of next upcoming flight or get in on any of the regular FSTV discussions on the weekly Tuesday night 10 PM (EST) ATV "Talk and DX Coordination" net held near 3.865 MHz. More and more ATVers are joining and using the 3.865 MHz frequency in the late evenings and early mornings to take advantage of DX openings and just to keep in touch with one another on what's happening in the world of Ham-TV! Drop by some Tuesday and join us!

Photo of the Month

This month's best ATV Shack Photo goes to Ron Cohen K3ZKO of the Philadelphia ATV Group. The photo shows a mixture of old and new equipment, most of which Ron built up himself. Ron has been a pioneer on ATV for over 20 years and is a former editor of A5-ATV Magazine.

See ya' next month, Ham-TV fans! Keep those cards and letters coming. de WB0QCD 73

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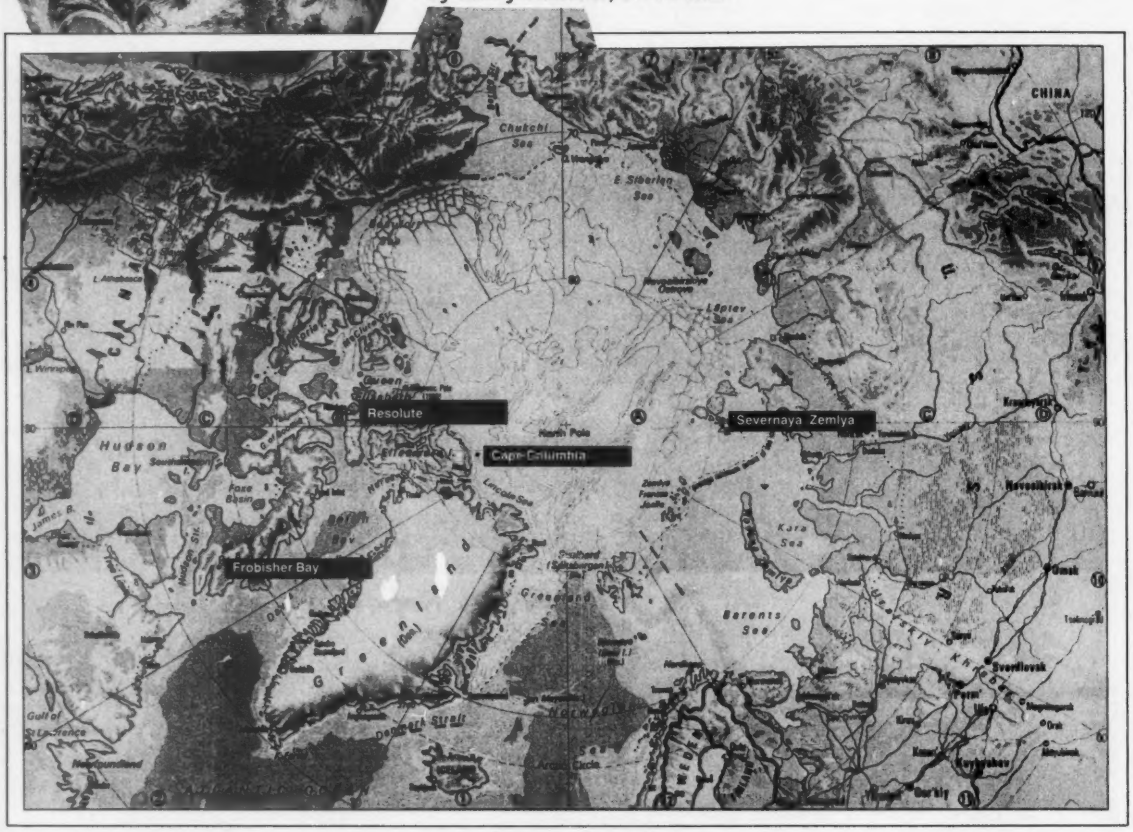
CIRCLE 47 ON READER SERVICE CARD

Look North!

Canadian and Soviet Hams Trekking Across the Arctic

by Larry Ledlow, Jr. NA5E



The low HF bands should liven up with arctic DX beginning in February. Canadian and Soviet scientists will participate in an historic, transpolar ski trek between Severnaya Zemlya archipelago and Cape Columbia on Ellesmere Island. Amateur radio will support the expedition, which will take more than three months and cover more than 2000 kilometers across the polar ice cap. Further, the Department of Communications has announced third party traffic and reciprocal operating agreements between Canada and the USSR between 1 November 1987 and the conclusion of the expedition (see QRX)!

Although the eight trekkers will carry out a number of scientific experiments, this is an excellent opportunity to demonstrate the reliability and utility of amateur radio communications. Dr. Dmitry Shparo UA3AJH, chief of the expedition, and Leonid Labutin UA3CR are two Soviet hams taking part in the journey. Both are well known and highly respected operators in the Soviet Union. The Canadian trekking hams had not been named at press time. Four team members from each country were to be chosen after exhaustive training exercises in the Tien Shan mountains of the USSR and near Frobisher Bay, Northwest Territories, during last fall.

CRRL president Tom Atkins VE3CDM is coordinating Canadian participation in the event. Canadian hams across the country will support the expedition by relaying traffic and scientific data from the ski team. Two communications bases will be established at Resolute and Frobisher Bay, NWT. Al d'Eon VE3AND, Tony Fegan VE3QF, Barry Garrett VE3CDX/CE8CDX, Gary Hammond VE3XN, Ron Belleville VE3AUM, Terry Keim VE8TF, Ron Lupack VE8AZ, and Larry Horlick VE8HL will man the bases on a rotating schedule for the duration of the trek.

Each day the team will communicate for approximately one hour with the communications bases, probably on 40 or 80 meters. The low bands tend to be more reliable for arctic communications. The skiers will carry equipment for MF, HF, and VHF communications. In addition, two search and rescue satellite (SARSAT) transmitters will be used. One SARSAT transmitter will allow the team to take daily position fixes, and the other will remain in reserve for emergencies.

Six air drops will provide fuel, equipment and other supplies to the team. The team will rest for several days at the air drop points and also carry out the main scientific experiments.

The expedition organizers wish to avoid any political association, in the interest of true international cooperation. As a result, the ski trek requires a great deal of private funding. Those interested in financially assisting this historic endeavor should contact the Polar Bridge Fund at Box 313, Don Mills, Ontario M3C 2S7. FI

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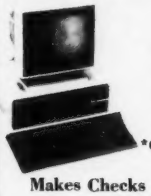

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ON THE AIR FROM LIBYA

Amateur activity from Libya has been very scarce over the past dozen years, with one exception. In late 1986 and early 1987, Hebert Trzaska SP6RT made more than 35,000 contacts from this North African spot. His story is an inspiring example of the resourcefulness and dedication of an active DXer, and well reflects the true spirit of furthering international goodwill through DX.

First Steps

Bert arrived in Libya in the fall of 1985, as guest of the Socialist People's Libyan Arab Jamahirija (SPLAJ), to teach in the electrical engineering department of recently erected Garyounis University, in Benghazi. Bert's first act there was to apply for permission to operate amateur radio equipment. He reasoned that this was a necessary part of his research into electromagnetic susceptibility (TVI and RFI) and propagation research.

Fully nine months and many inquiries later, Bert's amateur permission came through. Unfortunately, he couldn't bring in any radio gear at that time, nor get his own gear shipped from Poland. Imagine the frustration of a DXer in Libya with a license but no gear!

Typical ham resourcefulness came into action. Bert searched through the lab equipment at the university and found an excellent Rohde-Schwartz EK-070 receiver that would cover the amateur bands. The search for the transmitter was more difficult. He turned to various amateur radio and DX foundations for assistance, but most wanted assurance that the operation would count for DXCC before providing gear. Bert finally located a transmitter of sorts.

Getting on the Air

The university's lab included a Wavetek 178 signal generator that could pump out as much as 1 Watt, under ideal conditions. Bert was able to squeeze only a third of a Watt out of the generator, however, with his jury-rigged antenna. He increased this slightly by feeding the antenna through an attenuator. The better impedance match of the attenuator more than compensated for the 3-dB attenuation, and he was on the air with a half-watt into the antenna!

The arrangement was far from perfect. The antenna was hard to tune and his operation position was surrounded by high-power broadcast transmitters, which swamped available impedance-measuring devices. Keying the rig was yet another problem. Since it took too long to reach a stable frequency, Bert decided to key the antenna circuit instead of keying the frequency generator directly. Bert resorted to tapping a banana plug into a socket to key his signal. While continuing to scrounge for parts to build a simple amplifier or even a matching network, Bert fired up this improvised station as 5A0A on 14005 kHz on November 22, 1986, and logged G6ZO for his first QSO.

QRP Operation

Over the next three months, Bert logged nearly 6,000 contacts on every continent in more than 60 different countries. The first 2,000 QSOs were made with his makeshift "keyer." Small wonder The DX Bulletin reported at the time that Bert's CW was "very slow, and often strange!"

Gradually the amateur community began to help out. DJ2BW and DK1RV sent an electronic keyer to Bert at the end of January, and Bert's QSO rate doubled. Then, following the ARRL's acceptance of Bert's 5A0A operation for DXCC credit, the fledgling European DX Foundation chipped in a Yaesu FT-901D transceiver. Lack of rotor and cables, and difficulties with customs, however, foiled an attempt to erect a tribander donated by the INDEXA. Bert continued to use dipoles about 20 feet high for the rest of his operation.

Observations on the Bands

Bert had little trouble working Europe with his modest station. Almost 29,000 of his 35,000 QSOs were with European DXers. He worked 3,700 North American hams, and 2,300 Asians, but only a handful of Oceania, South American, and fellow African amateurs.

Bert made a particular effort to work as many stations as possible, but had to struggle through much QRM. He compares the pileups with the queues in meat shops in his native Poland. But he hung in there, and maintained an iron fist on the pileups. Bert kept control of the frequency by answering questions only when asked during a QSO, not answering obvious questions (What country is 5A?), and not accepting many skeds from other bands.

The usual DX "policemen" harassed his operation, particularly because his QSL manager, SP6BZ, was not listed in the latest Callbook. He avoided list operations with the single exception of Jim Smith VK9NS's net, which he used to work South Pacific stations.

Nearly Problem Free

His only real operating problem came from DXers seeking insurance contacts through duplicated QSOs on the same band and mode. Each such insurance contact reduced his chances of giving out Libya as a New One. Some DXers called more than 10 times, and soon found themselves on Bert's black list. "They'll find their wait for a 5A0A QSL to be a long one!" Bert says, "Fortunately the list contains very few call signs. Unfortunately, the majority of them are well-known DX-men."

Bert's operating schedule varied from day to day, but he spent much of his free time on the air, perched on his hard lab stool in front of the rig. Sometimes teaching pulled him away during prime propagation, but his job took precedence over the radio activities. Still, he was successful at working enough stations that he could occasionally call CQ and get no response. He took these opportunities to try some other bands, and work some SSB as

Photo A. Garyounis University in Benghazi, Libya, site of 5A0A.

Photo B. Bert Trzaska SP6RT operating 5A0A.

He even managed a few dozen QSOs on 60 meters before a rig problem forced him off his band.

well as CW. He even managed a few dozen QSOs on 160 meters, before a rig problem forced him off the band.

Bert wrapped up his 5A0A operation on July 1, 1987, after logging 35,569 QSOs in 167 countries. He expresses his thanks to those who provided invaluable assistance, including DJ2BW and DK1RV for the keyer, DK9KD and the European DX Foundation for the rig, the SPLAJ authorities for operating permission, and his co- workers and friends at Garyounis University for their support. 73

	80		40		20		15		10		Totals
	CW	SSB	CW	SSB	CW	SSB	CW	SSB	CW	SSB	
Eu	562	60	3944	370	8146	2001	7947	4256	1354	86	28726
Af	1		5		24	35	36	87	12	4	204
As	8		460	4	714	61	940	98	18	2	2305
NA	82		323	1	2261	335	279	398	10	1	3690
SA	2		22		29	27	127	171	44	6	428
Oc			5	5	49	101	26	27	3		216
Tot.	655	60	4759	380	11223	2560	9355	5037	1441	99	35569
%DX	14		17	3	27	22	15	16	6	13	19.24
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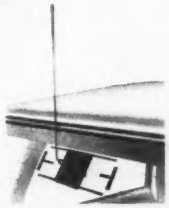

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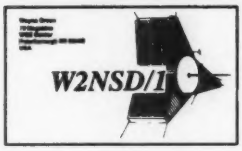
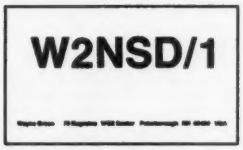
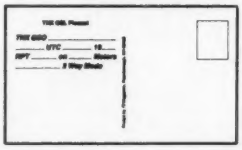


Style X





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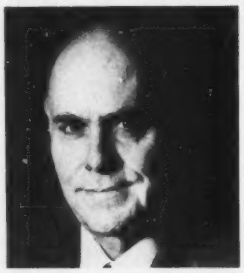

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1	Bandplan and Crystal Info	May 77
2	Conversion Data	May 77
3	Radio Shack TRC-47	Jul 77
4	E.F. Johnson Messenger 123A	Jul 77
5	Hy-Gain 670B	Jul 77
6	Antenna Suggestions	Dec 77
7	Radio Shack Realistic Mini 23	Dec 77
8	The Publicom I	Feb 78
9	How about SSB Conversions?	Jul 78
10	Radio Shack TRC-11 and TRC-74	Aug 78
11	Radio Shack Realistic Mini 23	Sep 78
12	Hy-Range 681A (Hy-Gain)	Sep 78
13	Kraco KCB-2310B	Oct 78
14	Lafayette Telsat SSB-75	Nov 78
15	Radio Shack Realistic TRC-452	Nov 78
16	CB Walkie-Talkie Conversion	Nov 78
17	Sharp Model CB-800A	Jan 79
18	SBE Sidebander III and Pace 123A	Jan 79
19	Midland 13-882C and Other PLL Rigs	May 79
20	Lafayette SSB-75 and SSB-100	Jun 79
21	Royce I-655	Nov 79
22	Johnson Viking 352	Nov 79
23	CB to 10 FM - Part I	Jan 80
24	CB to 10 FM - Part II	Feb 80
25	More Talk Power for the TRC-11	Mar 80
26	Sears RoadTalker 40	Mar 80
27	Penney's SSB Rig	Apr 80
28	The Poly-Paks 40-Channel CB Board	Jun 80
29	The Cobra 132	Jul 80
30	New Life for SSB CB Rigs	Jul 80
31	Double Your Channels in SSB Conversions	Jul 80
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34	Peaking and Tweaking Hy-Gain Boards	Mar 82
35	CB to CW? (Hy-Gain)	Jul 82
36	Maximum Modulation for CB Conversions	Dec 82
37	Beef Up Your CB-to-CW Conversion	Feb 83
38	Add a Digital Readout to Your CB Conversion	Feb 83

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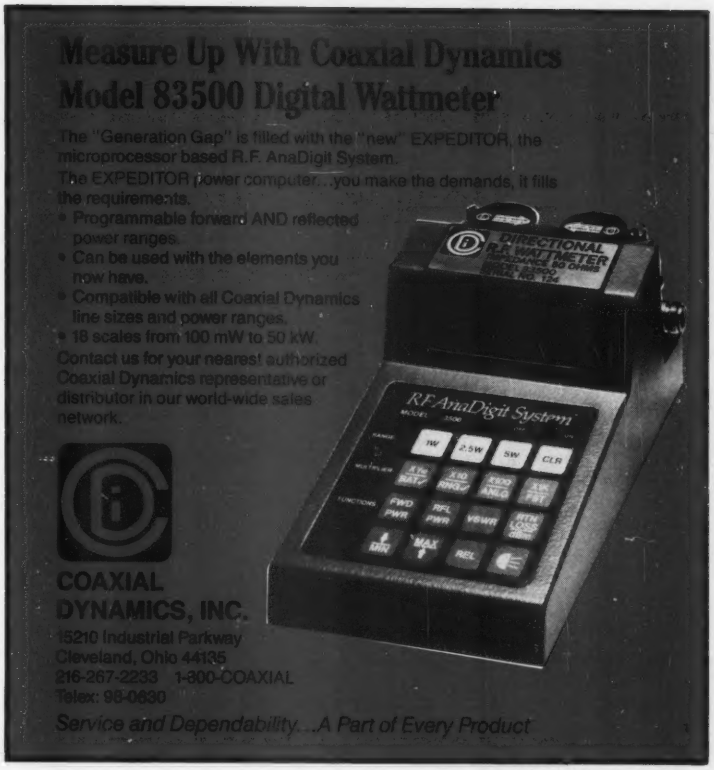
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FEEDBACK

In our continuing effort to present the best in amateur radio features and columns, we've decided to go directly to the source—*you*, the reader. Articles and columns are assigned feedback numbers, which appear on each article/column and are also listed below. These numbers correspond to those on the feedback card opposite this page. On the card, please check the box which honestly represents your opinion of each article or column.

"What's in it for me?" comes the cry from our faithful readers. Besides the knowledge that you're helping us find out what you like (and don't like), we'll draw one feedback card each month and award the lucky winner a free one-year subscription (or extension) to *73*.

To save some money on stamps, why not fill out the Reader Service card, the Product Report card, and the Feedback card and put them in an envelope. Toss in a damning or praising letter to the editor while you're at it. You can also enter your QSL in our QSL of the Month contest. All for the low, low price of 22 cents!

Feedback #	Title	Feedback #	Title
1	Welcome Newcomers	22	Above and Beyond
2	Never Say Die	23	New Products
3	QRX	24	Barter and Buy
4	Working the World Fast	25	Propagation
5	W87PAX Pan Am Games	26	ATV
6	Review: IC 475	27	Ski across Pole
7	Review: Heil Boomset BM-10	28	DX
9	Troubleshooting Tricks	30	Packet Talk
10	The Colvins	31	Weathersat
11	DX QSL cards	32	RTTY
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13	Digital Receiver	34	Hamsats
14	Nets to Check	35	73 International
15	Dynasty Award	36	International DX
16	DX Country List	37	Aerial View
17	The 100 Winners	38	Novice 10 Meter DX
18	DX Newsletters	39	QRP
19	Commodore 64/128	40	Op Ed
20	Dealer Directory	41	Index: January
21	Circuits		

ATTENTION TRAVELING HAMS!

Want to operate in other countries while you are traveling? Here's how!

edited by Richard Phenix

Hams in the US: Except in Canada, a permit to operate is needed in every country. In countries with which the US has a reciprocal agreement, no exam is needed; in others, you may or may not be permitted to operate. 73 International strongly recommends you begin any travel planning (months before your scheduled departure) with a business-size SASE to the ARRL Information Service requesting its "six-page general information packet." Then, follow the ARRL suggestions.

Non-US Hams: Write your own national radio society for similar information. Be sure to include return postage.

All countries require basic information when you apply for a permit to operate within their boundaries. In addition, each usually has special requirements. See the form below for an attempt at coverage of basic information. 73's foreign correspondents will be working with this and sending in additions and corrections, and all readers are encouraged to do likewise. When (if?!) we think we have succeeded in creating a good form, we will publish it in English (with all items on the form repeated in the other five official United Nations languages).

Beginning with this issue of 73, the special requirements of a few countries will be listed in addition; in following issues during 1988 we will try to cover all the countries popular with visiting hams. Want to promote your country? Send 73 International any requirements not covered in the sample form below; the address to which permit applications should be sent, fees required, how fees can be paid, and any other information that would be helpful to our readers.

Sample: Application for Operating Internationally:

Application for Permission to Operate

The following-named radio amateur respectfully requests the permission of the government of _____ to operate amateur radio equipment in the country. If permission is granted, the undersigned agrees to operate in accordance with

(1) The rules of the (ITU) Geneva Radio Regulations governing amateur operation
(2) The terms and conditions of the amateur radio license issued by this operator's government
(3) The terms and conditions of the bilateral agreement (if any) between this operator's government and the permit-issuing government, and
(4) Any further conditions attached to the permit issued. I certify that the information given below is true and accurate.

Date Signed: _____ Full Signature: _____

Last name _____ First name _____

Nationality _____ Are you a citizen of the country? _____

Place and date of birth _____

Home mailing address _____

Home telephones: Residence _____ Office _____

Call sign _____ Operating license number _____

(ATTACH PHOTOCOPY of license) Expiration date _____ Class _____

Address while in permit country _____

Location of operation _____

Passport number and country _____

(Attach photocopy of pages showing name and number.)

Occupation _____

Permit requested from (date): _____ to: _____

If mobile, license number of vehicle _____

Xmtr power input _____ Watts _____

Description of equipment (Include brands, models, and serial nos.) _____ Xmtr _____ Receiver _____

Antenna _____ Frequency bands _____

Types of emission _____

SPECIAL INFORMATION FOR (Name of country):

_____

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April 29, 30, May 1, 1988

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VHS video presentation about the HAMVENTION is available for loan. Contact Dick Miller, 2853 La Cresta, Beavercreek, OH 45324

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Lodging: April 2
License Exams: March 26
Advance Registration and banquet:
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Reservation Deadline - April 2, 1988

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Arrival Date _____
[ ] Before 6 pm [ ] After 6 pm
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(PLEASE SEPARATE)

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Dayton Hamvention 1988
Reservation Deadline - USA-April 4, Canada-March 31

Name _____

Address _____

City _____ State ____ Zip _____

	How Many		
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(Sunday)	_____	@ $6.75	$_____
Flea Market (Max. 3 spaces)	_____	$23/1 space $50/2 adjacent $150/3 adjacent	$_____
Admission ticket must be ordered with flea market tickets		**Total**	$_____

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THE MURKY WORLD OF PROTOCOLS

Packet radio is getting ready to go through a major change. Many people involved with the development have discovered that AX.25 Level 2 is not capable of supporting the growth, and we now need some sort of Layer 3, or networking, protocol. I have received a number of requests asking for a better explanation of what is going on in this area. This is the first in an ongoing series on networks and how they relate to your packet radio station.

In order to facilitate discussion of networks, the International Standards Organization (ISO) came out with a recommendation for the description of networks. This became known as the reference model of Open System Interconnection (OSI) or the "seven-layer network" model. Let's quickly go through the layers and their general meanings.

Layer Definitions

The PHYSICAL layer (layer 1) does those things having to do with the physical data transport. Items such as modems, cables, data rates, and interface specifications all fall into this layer.

The LINK layer (layer 2) embodies whatever protocols and techniques are necessary to deliver packets from one point to another within the network, often in an error-free fashion.

The NETWORK layer (layer 3) handles the routing of packets from their original source to the final destination.

The TRANSPORT layer (layer 4) ensures the proper end-to-end delivery of packets from source to destination.

The SESSION layer (layer 5) is responsible for keeping the packets from one session separate from those of another. For example the SESSION layer would ensure that my file transfer does not get mixed up with my keyboard QSO even though they are going from the same source to the same destination.

The PRESENTATION layer (layer 6) handles generic operations such as ASCII to Baudot conversions and data encryption.

The APPLICATION layer (layer 7) provides a way for programs and users to access the network in an orderly fashion.

ISO Model and Current Packet Radio

For most of us in packet radio, the physical layer means an narrow bandwidth FM signal in the 2-m band with a peak deviation of 3 kHz modulated with an AFSK signal using 1200- and 2400-Hz tones. The bit stream is encoded using Non-Return Zero Invert (NRZI) and sent at the rate of 1200 bps.

The link layer is the High-level Data Link Control (HDLC) frame format with its built-in error detection in the form of a Cyclical Redundancy Check (CRC). The link protocol is very simple. If the CRC shows that a packet is in error, the packet is discarded. Note that while this ensures that bad data won't get delivered to the destination, it does not ensure that good data will get delivered.

The network layer is our digipeater specification. When you establish a connection, you must tell the TNC the precise route to use to get to the destination. This is called strict- source routing.

The transport service is provided by AX.25 Level 2. If a packet is lost somewhere between the source and destination the transport service (AX.25) will cause that packet to be resent. Notice that the transport service will ensure receipt of packets end-to-end and it is not absolutely necessary that the link layer ensure delivery of data.

The session layer is rather nebulous, but someone could make an argument that the stream switch is used to keep sessions with multiple stations separate and could therefore be considered by some to be a form of session protocol. The presentation layer is again rather difficult to locate in our TNCs, but I guess that we could consider the TNC commands FILTER, LFADD, and LCOK to be a form of translation.

The application layer is represented by TNC's command processor and the interface to your terminal.

Questions about AX.25

Ok, ok, I can hear the screams of protest already. I know what many of you are going to say: AX.25 is really only a link-layer protocol and that the addition of a "layer 3" atop our existing AX.25 "layer 2" protocol is, in fact, what all this networking hoo-rah is about. I agree that AX.25 is supposed to be only a "layer 2" protocol, but that is not how it is used now. AX.25 makes sure that the packets are delivered from end-point to end-point and therefore qualifies as a transport protocol. Someone once said to me, "If it looks like a duck, quacks like a duck, and swims like a duck, then it is probably a duck."

"AX.25 is supposed to be only a layer-2 protocol."

Let's dig a little further into some of the complaints that are surfacing. First, as Tom Clark W3IWI pointed out a while back in his famous, "But wait, there's more," article, trying to push packets through more than about two digipeaters is a fruitless activity. Besides, the eight-digipeater limit and being required to specify the entire route is also annoying and very limiting. So the real complaint is that most of you do not like the existing link, network, and transport protocols and would like to relegate AX.25 to the job of being a link protocol, a job it was originally designed to do. OK, I'll buy that. But, if you do that, you need a new networking and transport protocol. Therein lies the furor—how to best accomplish this task.

Datagrams and Virtual Circuits

In order to go much further, you need to understand some other concepts. A major debate to date has raged on the differences between a datagram-based network and a virtual-circuit network. These differences have a great deal to do with how the network and transport protocols do their jobs.

Datagram and virtual circuit (VC) networks may work in a similar fashion or they may be very different. The definition of a datagram network is that every packet contains the full source and destination addresses (that means that our existing implementation of AX.25 is a datagram-based network and transport protocol with strict-source routing). This allows the network the option of routing each packet independently.

The analogy used most often is that of the post office. You take your file or message, break it up into packets (letters), and transmit (mail) each one separately. By virtue of this technique there is no guarantee that the network (post office) will keep the packets (letters) in the same order so that it becomes the job of the transport service (the recipient of the mail) to reassemble them into the proper order. As a consequence the transport layer does more of the work allowing the network layer to be simpler.

On the other hand we can construct a VC network and use the analogy of the phone system. An exchange begins with a call request packet (dial the call) traveling through the network. At each node in the network that particular "call" is assigned a Logical Channel Identifier (LCI). From then on each packet contains the LCI rather than the address and every packet takes the same route through the network much like you are assigned a channel from the beginning of a phone call until you hang up again (or are disconnected). As a result of this a VC network tends to have a more complex network layer and a simpler transport layer.

Both approaches have their plusses and minuses. There are two advantages of a VC-based network:

- It switches packets faster because it doesn't have to look up the route for each packet. That's done at the time of the call-request packet.
- The full address isn't needed in every packet so header overhead is less.

Datagrams also offer two advantages:

- If a switch should fail other switches can easily bypass the failed switch and keep the packets moving. Any packets lost when the switch failed are retransmitted by the source transport service when the loss is finally detected.
- Each packet is treated separately so a switch does not need to "remember" anything about the

past (no "channels"). Most of the memory in the switch can be used for buffering without concern for where packets come from or where they are going.

Thus, the key difference between the two approaches is that a virtual circuit switch can support only a limited number of connections and will "disconnect" all connections passing through it if it fails. In the commercial world where extremely reliable hardware is the rule, this usually is not a problem. On the other hand, a datagram network handles changes in and damage to the network much better than a VC network.

Packet Networks Today

Currently there are three networking packages in amateur packet radio, all based on datagrams. These three networking packages are NET/ROM, TEXNET, and NET.EXE. A fourth, COSI, was announced about a year ago but has not been released. It uses virtual circuits and is based on some of the ISO and CCITT protocol recommendations. I will talk about it in another column when the software is finally available.

NET/ROM is available in the form of a replacement ROM for the TNC-2s and is intended to essentially replace digipeaters. TEXNET is a set of software that runs on a special piece of hardware called a Node Control Processor (NCP) designed by the members of the Texas Packet Radio Society. NET.EXE is an implementation of the international standard Internet Protocol Suite (TCP/IP) and runs on PC clones, the Commodore Amiga, the Apple MacIntosh, and most small UNIX systems.

Which one of these packages or approaches is best? The answer is simple: it depends upon your application and interest. Before you decide which networking package is best, you need to decide what services you want the network to provide.

NET/ROM

To date all amateur packet operations have been based on the concept of a user sitting at a terminal conversing with another user or with a BBS. The other concept is that of a computer conversing with another computer. If you are satisfied with rag-chewing and using the local BBS then very little needs to be changed. In that case, NET/ROM will probably appeal most to you since it is by far the simplest change to our existing network.

NET/ROM nodes connect to each other using AX.25 and then converse with each other using their own internal protocol. You use a NET/ROM network by connecting to your local NET/ROM node, telling it to connect to the NET/ROM node closest to the destination, and then telling that NET/ROM node to connect to the destination (three connect commands are always required). In this manner NET/ROM replaces the digipeaters and removes the requirement for strict-source routing. However, you still need to know where your local NET/ROM node is and what NET/ROM node is nearest your destination.

"Any TNC-2 can be turned into a NET/ROM node."

Internally, NET/ROM uses datagrams. The NET/ROMs share information about what other NET/ROMs are in the network. Each NET/ROM maintains a list of all the other nodes in the network and will attempt to route packets around a failed node should the need arise.

There is no concept of a logical connection except at the edges of the network where the end-user TNCs connect. NET/ROM has a transport (layer 4) protocol that provides reliable service up to the point where users' TNCs connect and therefore is not a true transport protocol. A true transport protocol is end-to-end. Perhaps what NET/ROM has can be called an edge-to-edge protocol, meaning it provides reliable service to the edge of the network where the user connects.

Any TNC-2 can be turned into a NET/ROM node. All you need to do is remove the old TNC program ROM and insert a new ROM from Software 2000. Once this is done the TNC is no longer useful as an end-user TNC—it becomes a packet switch only.

For NET/ROM to work well you must have two or more TNCs and an appropriate number of NET/ROMs (extra ROMs used in this manner are available at a lower price). The TNCs are connected together at the asynchronous (terminal) ports. This provides the potential for multi-frequency packet switching, a must for efficient operation. (Next month I will discuss why repeating packets on the same frequency is a no-no and why simplex digipeaters should be abolished).

TEXNET

This package comes next in the area of interest and services. TEXNET is also a datagram service but it has no end-to-end or edge-to-edge transport-like protocol. For keyboard-type operation this is not a real problem because the user can act as a transport protocol and restart a session should he/she become disconnected. TEXNET becomes really interesting when you discover that it is providing services such as the network BBS, the conference bridge (round-table type of operation), and the weather-service interface. Finally something more than the venerable BBS!

As far as I can tell, the major drawback to TEXNET (if it has one) is that it runs only on a special Node Control Processor (NCP) designed by the Texas Packet Radio Society. I have no idea how available it is, but I surmise that it is not as easy to get as a TNC-2 or a PC clone.

NET.EXE

The last networking package I will discuss this month is NET.EXE written by Phil Karn KA9Q. Unlike the other two packages, it makes a fairly radical break from traditional packet in that it does not make an attempt to use a standard TNC for the user interface. Instead it requires a more powerful personal computer such as a PC clone. It uses the international standard Internet Protocol Suite otherwise known as TCP/IP (named for the most significant protocols in the suite, the Transmission Control Protocol and the Internet Protocol). IP is the network layer and is a true datagram protocol. TCP is the transport service that handles the end-to-end request for retransmission of lost packets and resequences out-of-sequence packets. The result is a network that looks like a VC to the user or application but has the advantages of a datagram network.

NET.EXE doesn't just stop there either. It provides three applications: the File Transfer Protocol or FTP, the Simple Mail Transfer Protocol or SMTP, and a terminal-to-terminal and terminal-to-host protocol called TELNET. In addition to providing these services, NET.EXE is fully multi-user and will support multiple FTP, TELNET, and SMTP sessions concurrently. The distribution of NET.EXE comes with full technical documentation and source code so that you can make your own changes and enhancements.

In Conclusion

Aren't these protocols mutually exclusive? If you choose one do you have to forego the advantages of the others? Not necessarily. However, this leads us into the realm of internet working (interconnecting two or more dissimilar networks), a subject I will discuss in detail in a subsequent column. I will give you a hint though: notice that the network protocol in TCP/IP is called the Internet Protocol.

That's it for this month. Next month I will be talking about improvements to the physical layer: modems, radios, and channel access techniques. See you then!

For further information on the protocols discussed in this column:

NET/ROM: Software 2000, Inc.
1127 Hetrick Avenue
Arroyo Grande CA 93420
(804) 489-1977

TEXNET: Texas Packet Radio Society, Inc.
PO Box 831566
Richardson TX 75083

NET.EXE: Tucson Amateur Packet Radio Corp.
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Tucson AZ 85734

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Dr. Ralph E. Taggart WB8DQT
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Mason MI 48854

IMAGE PROCESSING

Last month I began a discussion of image processing techniques, which I continue with here. Prior to doing that, however, I want to diverge just slightly to discuss some aspects of tape systems since taped signals will be a primary image source for many approaches to video processing.

The Audio Tape Dilemma

Whenever we engage in significant contrast enhancement, we are taking a small range of signal amplitude variations and converting them to a wider range of output variations. When we do this, the quality of the signal becomes quite critical. Subcarrier level variations, noise, or other signal anomalies that might be barely visible in a linear display can become quite objectionable when we expand the contrast of the display. If we take 25% of the subcarrier dynamic range and expand it to the full dynamic range of the display system, we essentially expand contrast by a factor of 4. Any unwanted amplitude shifts in the signal will be expanded to the same degree! Proper upkeep and servicing of the tape system is of primary importance if you really want to manipulate the image data.

Analog Processing

In this age of digital marvels, it may seem strange to suggest that anything useful can be accomplished using analog processing, but it is surprising what some fairly simple techniques can do. An example of this has already been alluded to with regard to expanding the contrast of visible light data. In all of the Weather Satellite Handbook (WSH) circuits, including the scan converter, the output of the video detector is clipped to a maximum of approximately +5V by a zener diode at the output of the post-detection filter. In effect, no matter how hard you drive the video contrast, white level cannot exceed this limit. This is what makes it possible to adjust the video drive to whatever is required to get good visible light contrast without, at the same time, over-driving the display system with IR signal levels.

Although simple approaches work well for visible data, solving the IR problem is more complex. An interesting approach was taken by Bayless in the design of a contrast expansion processor for NOAA IR data which appeared in Wireless World about ten years back. He used DC-biased diode networks to pass both the positive- and negative-going halves of the 2400-Hz subcarrier signal in a manner that essentially clips the signal to permit the upper part of the dynamic range to be expanded to full contrast.

In essence, the circuit is an audio clipper that will only pass subcarrier peaks that exceed a preset level. The result is any degree of expansion of the contrast at the white end of the grayscale with all video values below the threshold converted to black. Because of the way the circuit works, there is essentially no subcarrier signal at all in these "black gaps," so if you are using subcarrier lock for timing, you had better rewire your system to lock to a subcarrier signal ahead of the processor to avoid a loss of lock during much of a typical visible light line. The circuit is fairly simple, but an oscilloscope is a necessity because of the critical level adjustments. The main advantage of the circuit is that it slips between the video source (receiver, tape deck, etc.) and your unmodified display system.

Transparent Digital Processing

Analog circuits to perform more complicated processing tasks soon get very complicated and can be very elaborate to set up. In contrast, digital techniques are comparatively simple. Fundamental to any digital processing scheme is the conversion of analog data to digital (numerical) form, also known as A/D conversion. At this point, we can begin to modify the data by numerical or mathematical operations.

Although you might think that digital image techniques would be limited to a digital imaging system, we can perform a wide range of operations using what I refer to as "transparent" digital processing. In effect, we insert a digital processing "black box" between our signal source and our display system, whether digital or analog. Such an approach permits you to perform a wide range of image-enhancement experiments and procedures without altering your display system in any way.

One of the simplest ways to incorporate this digital "transparency" is shown in Figure 1. IC U1 performs an A/D conversion, followed by IC U3, which takes the digital output of U1 and performs a D/A conversion! Bear with me for a moment and all will become clear!

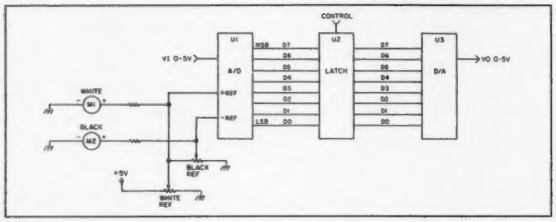

Fig. 1. Digital processing circuit. The BLACK and WHITE REF controls can be set to provide any degree of enhancement over any given segment of the input waveform.

U1 is a basic hardware A/D chip and a great many ICs could be used—an ADC-0804 is one inexpensive option. A 0–5V video signal (derived from your normal video detector/filter for example), is applied to the input and an 8-bit digital value (0–255) will appear on the 8 digital output lines, corresponding to the analog voltage level on the input. 8-bit video conversion, with 256 possible grayscale steps) is so close to analog in quality that it might as well be analog!

In this application the chip should be wired so that it is constantly making conversions, one after the other. A chip such as the ADC-0804 will complete a conversion in approximately 100 microseconds. The free-running chip will therefore complete approximately 2500 conversions in the course of a WEFAX line or the visible or IR segment of an APT line so there is no problem with limiting resolution! There are other gimmicks associated with the A/D chip but we will skip these for the moment. U2 is an octal latch that will hold the 8-bit output from U1 constant, updating the digital lines at the completion of each conversion.

The 8-bit digital value from U1 is converted back to analog by U3, a hardware 8-bit digital to analog (D/A) converter. Again, there are a wide variety of commercial chips that will do the job. Alternatively, a number of op-amp stages (summing amplifier plus gain/offset stages) could perform the same function. In effect, we go from a 0–5V analog signal at the input, through 8-bit digital, and back to 0–5V analog.

The Point

"So What?" you may say. Let's look, however, at two features of U1, the "+" and "-" reference inputs, which we have ignored up to this point. To perform the usual linear conversion, the "-" reference input would be held at ground and the "+" reference input would be wired to +5V. In that configuration, the 256 output steps would be evenly spaced between 0V and +5V. In effect, the output waveform would be a duplicate of the input signal and we would not even realize that the circuit was in place. In this circuit,

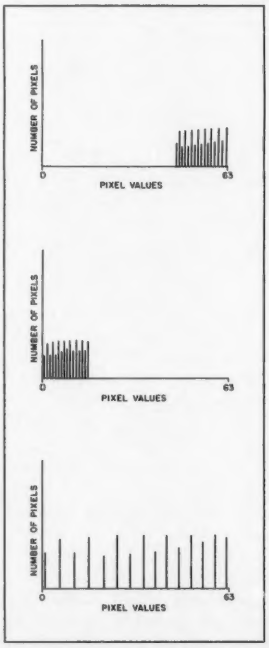

Fig. 1b. This shows the principle of "reassigning" pixel values from low contrast images to give improved displays.

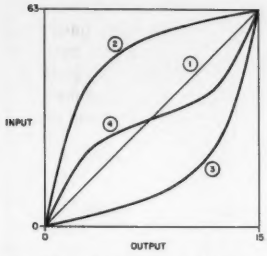

Fig. 2 Non-linear contrast curves. Details next month.

however, we have connected the reference inputs to two reference pots, allowing us to set the "+" and "-" reference values. Each reference input is connected to a voltmeter (M1 and M2). For the sake of obtaining the best possible resolution, these voltmeters could be 1-mA units, each with a series resistor to provide full-scale deflection at +5V. The use of 0–1.0 scales on the meters is convenient in that we use the meter readings as a percentage of the input waveform.

The use of these variable reference voltages is best illustrated by going back to Figure 1 of last month to tackle the rather extreme problem of the visible and IR data. Let's take the IR problem first. The basic IR problem was one of limited dynamic range, all of it concentrated at the high end, resulting in a white display with little or no detail. What we would like to do is to expand this small dynamic range to something approaching a full black-to-white "swing."

Suppose that we want to expand the contrast of the upper 25% of the video dynamic range. To accomplish this, the WHITE REF pot would be set for a reading of 1.0 (100%, or +5V) on M1 while the BLACK REF pot would be adjusted for a reading of 0.75 (75%, +3.75V) on M2. On this configuration, all of the 256 output steps will be within the range of 3.75 and 5.00 V. Any value below 3.75 will give a 0 output. In effect, the entire 0V to +5V output from U3 will represent video variations over the upper 25% of the video dynamic range. Assuming that we have not set our video gain so high that we have clipped the IR channel at +5V at the input, the result will be excellent contrast for the IR data.

If we wanted to enhance the contrast in the visible light channel we could take a similar approach. To expand the lower 25% of the video dynamic range, for example, we could set the WHITE REF pot for a reading of 0.25 while the BLACK REF pot would be set for a reading of 0. Now the full-range output represents the lower 25% of the video waveform, the result being excellent contrast in the visible channel data!

In effect, the BLACK and WHITE REF controls can be set to provide any degree of enhancement over any given segment of the input waveform. Note that the way the controls are set up, the voltage set by the BLACK REF pot will always be less than that established by the WHITE REF control, which is as it should be! For a linear conversion, simply set the WHITE REF for 1.0 and the BLACK REF for 0, otherwise, the controls should be set for the desired black and white limits.

Extremely Versatile

This particular circuit can be used in a "stand-alone" mode by simply inserting it between the video detector/filter output and the remaining circuits in any display system. The circuit can be placed in its own cabinet with input and output jacks added to your existing display system. For a display system that uses something else other than a 0–5V video range, the system can be tailored to any other voltage range.

You can expand the utility of the system even further by putting a computer in the loop between U2 and U3. The computer can read values from U2, modify them, and feed another output value to U3. The computer can run in an "open loop" mode, simply making conversions as quickly as possible. Assuming reasonably compact assembly language code, most computers should not greatly diminish the inherent resolution of the system. The possibilities for conversion will be outlined in next month's treatment of digital enhancement techniques.

The "transparent digital" approach illustrated here is an optimum approach for existing analog display systems such as CRT monitors and FAX recorders in that you obtain some of the flexibility and ease of digital processing in the context of an analog system. This approach will also work well with dedicated digital scan converters, since it is rarely possible to alter the hard-wired aspects of such systems and alteration of the programming of microprocessor-based systems is a highly specialized undertaking. This is also true in the case of computer-based systems where you lack the skill (or the will!) to alter the system programming to incorporate new imaging options.

Next month we will examine some aspects of purely digital image processing.

Picture of the Month

This shows a bit of what can be accomplished with an outboard processor along the lines of this month's discussion. It represents a Smartfax print from the WSH scan converter of a winter NOAA visible light pass over the Great Lakes. With the scan converter contrast set for good WEFAX display, the visible light channel was extremely dark with just a bit of brightening on the cloud features. With the same contrast setting, running the signal through the external processor serves to bring out features that would not otherwise be visible without completely altering the scan converter contrast. 73

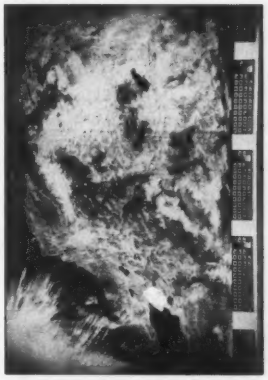

Photo A. Smartfax print of the Great Lakes (toward upper right).

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DEFINITIVE CoCo RTTY

I've included listings here sure to gladden many a CoCoer's heart. Thanks to N6LQV, who prefers to be known only by his callsign, we have an updated version of the CoCo RTTY program published in my June '87 column.

This is an interfaceless program. It decodes audio directly presented through the cassette interface input, and puts out an audio tone frequency shifted in step with the RTTY being sent. The key difference between this program and the original version is the raft of features added.

To begin with, disk access is directly supported. The transmit buffer can be loaded from disk, and data saved into a receive buffer saved to disk. Although this program is limited to five-level Murray (Baudot) code, common speeds are supported, from 45 bauds (60 wpm) to 75 bauds (100 wpm).

This is not a disk-only program. This one is both disk and tape, and, because it appears to use BASIC calls to routines, should work well with most types of Disk ROMs. After the tape-only listing in June, and the disk-only one in July, I hope this squares the record with all the CoCo folks.

The Programs

Two programs are presented here. The first, is the BASIC language driver for the program. Type this in exactly as presented and save it on disk as "RTTY.BAS". Later, you will boot the program by typing RUN"RTTY. Remember to format the listings for these programs into 32-character lines to match the standard CoCo display.

The second program is a BASIC loader that creates the machine-language program, RTTY.BIN, which does the bulk of the work. Note that it is self-checking. If you make a typo while entering the program it will not run, but will tell you about it.

Save this program as MAKERTTY.BAS and RUN it, and it will create the required RTTY.BIN program for you. You may then discard or archive MAKERTTY.BAS.

There are a few options to keyboarding in these programs. Subscribers to Delphi can find the upload of the complete files for this program in the CoCo SIG's Data Communication database. This is courtesy of Marty Goodman, one of the SYSOPs of the Color Computer SIG. After logging onto Delphi, type GROUP COCO to go to the CoCo SIG, then select DATABASES, and DATA COMMUNICATION.

You can also take advantage of my usual deal. Send me two bucks, a blank tape or disk (no need to format the disk, by the way), and a stamped, self-addressed disk mailer. I will load these programs, a ready-to-run binary file, the source code for the binary file, and some written information, and ship/wire/hand the whole kit and caboodle back to you. My thanks to N6LQV and Marty Goodman for making this blockbuster of a program available to the readers of RTTY Loop.

How to Use the Program

As stated above, this is an "interfaceless" program. The receiver audio feeds directly into the CoCo using the plug that normally would go into the EAR jack on the cassette recorder (the black plug), and it sends AFSK via the cassette record output (the gray plug).

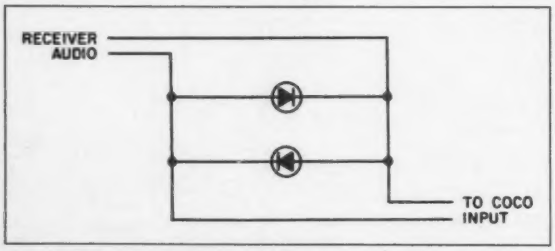

Figure 1. Schematic for a simple limiter.

RTTY.BAS Program

```
5 REM THIS PROGRAM IS PUBLIC DOMAIN, BY N6LQV
10 CLEAR 200,&H4000:C=3
20 D=(PEEK(&HC000)=68):REM TAPE:
D=0, DISK: D=-1
30 IF D THEN LOADM"RTTY" ELSE CL
OADM"RTTY"
40 DEFUSR0=&HE00:DEFUSR1=&HE03
50 DEFUSR2=&HE06:DEFUSR3=&HE09
60 DEFUSR4=&HE0C:DEFUSR5=&HE0F
100 A=USR0(0):R=0:T=0
110 CLS:AUDIO ON:MOTOR OFF
120 PRINT"••••  RTTY TERMINAL PRO
GRAM ••••"
130 PRINT"
BYTES"
140 PRINT" SAVE RECEIVE BUFFER
";R
150 PRINT" PRINT "    ""
160 PRINT" SHOW "    ""
170 PRINT" RECEIVE/TRANSMIT"
180 PRINT" LOAD TRANSMIT BUFFER
";T
190 PRINT" CLEAR ALL BUFFERS"
200 PRINT" BAUD RATE: ";
210 ON B+1 GOTO 220,230,240,250
220 PRINT"45 WPM: 60":GOTO 260
230 PRINT"50 WPM: 67":GOTO 260
240 PRINT"57 WPM: 75":GOTO 260
250 PRINT"74 WPM: 100":GOTO 260
260 PRINT
270 PRINT"DURING RECEIVE/TRANSMI
T:"
280 PRINT" BREAK: RETURN TO THIS
MENU"
290 PRINT" CLEAR: TOGGLE RECEIVE
/TRANSMIT"
300 PRINT" RIGHT ARROW: TRANSMIT
BUFFER";
310 A=C*32:PRINTA+32," ";:PRIN
TA+64,"->";:PRINTA+96," ";
350 FOR I=0 TO 30:NEXT
360 A$=INKEY$
370 IF C>0 AND (PEEK(341) AND 8)
=0 THEN C=C-1:GOTO 310
380 IF C<6 AND (PEEK(342) AND 8)
=0 THEN C=C+1:GOTO 310
390 IF A$>CHR$(13) THEN 360
400 ON C+1 GOTO 800,500,550,600,
700,100,950
500 IF (PEEK(&HFF22)AND1) THEN 110
510 A=USR5(-2):PRINT" ":GOTO 110
550 CLS:A=USR5(0)
560 IF INKEY$="" THEN 560 ELSE 110
600 CLS:PRINT"RTTY RECEIVE   M
ARK->-SPACE":R=USR1(B):GOTO 110
700 S$="LOAD FILE":GOSUB 900
710 IF A$="" AND D THEN 110
720 CLS:PRINT229,"LOADING ";A$
730 IF D THEN F=1 ELSE F=-1
740 OPEN"I",F,A$:A=USR2(0)
750 IF EOF(F) THEN 790
760 LINEINPUT #F,A$
770 A$=A$+CHR$(13):A=USR3(A$)
780 IF A THEN 750
790 CLOSE F:T=USR4(0):R=0:GOTO 110
800 IF R=0 THEN 110
810 S$="SAVE FILE":GOSUB 900:IF
A$="" THEN 110
830 CLS:PRINT229,"SAVING ";A$
840 IF D THEN F=1 ELSE F=-1:GOTO
870
850 PRINT293,"ARE YOU SURE (Y/N
)";:INPUT S$
860 IF S$>"Y" THEN 110
870 PRINT293,"":OPEN"O",F,A$
880 A=USR5(F):CLOSE F:GOTO 110
900 CLS:PRINTS$:PRINT
910 LINEINPUT"FILENAME?";A$
920 RETURN
950 B=B+1:IF B>3 THEN B=0
960 PRINT269,"";:GOTO 210
```

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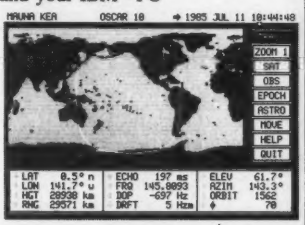

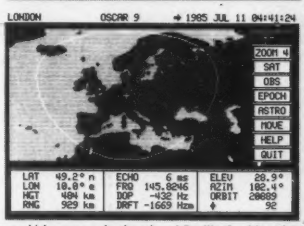

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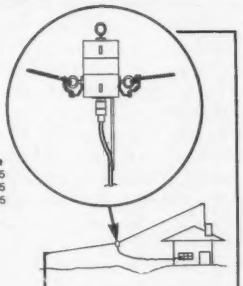
PERFORMANCE +©



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$24.95

Models:
RAG-1.1 (50/75 balanced - 50/75 unbalanced)
RAG-4.1 (300/200 balanced - 75/50 unbalanced)

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- Easy to change center frequency
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- Can be installed as a sloper

K2RAG Matched Dipoles

Model	Band	Length	Price
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RAG-D40	40	65'	$45.95
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RAG-D10	10	13'	$35.95

Antenna Systems Inc.
14465 SW Hazelhill Dr.
Tigard, OR 97224
503-684-5350

CIRCLE 122 ON READER SERVICE CARD

MAKERTTY.BAS
(Formatted 32 Characters Across)

```
10 REM THIS PROGRAM IS PUBLIC DO
MAIN, BY N6LQV
20 PCLEAR4
30 CLS
40 PRINT"  RADIO TELETYPE TRANS
CEIVER"
50 PRINTSTRING$(32,"-");
60 PRINT
70 PRINT"NOW GENERATING MACHINE
LANGUAGE"
80 PRINT
90 PRINT"PLEASE WAIT..."
100 ST=&HE00:AD=ST:LI=900
110 READA$,CS
120 IF A$="X" THEN 200
130 FOR I=1 TO 64 STEP 2
140 A=VAL("&H"+MID$(A$,I,2))
150 POKE AD,A:CS=CS-A:AD=AD+1
160 NEXT
170 IF CS THEN PRINT"DATA ERROR
IN LINE";LI:END
180 PRINT174,949-LI
190 LI=LI+1:GOTO 110
200 IF PEEK(&HC000)=68 AND PEEK(
&HC001)=75 THEN B$="DISK" ELSE B
$="TAPE"
210 PRINT96,"PROGRAM IS NOW IN
MEMORY AND"
220 PRINT"READY TO BE SAVED. INS
ERT ";B$
230 LINEINPUT"AND PRESS ENTER ";
A$
240 IF B$="DISK" THEN 280
250 CSAVEM"RTTY",ST,AD-1,CS
260 LINEINPUT"PRESS ENTER TO SAV
E AGAIN ";A$
270 GOTO 250
280 SAVEM"RTTY/BIN",ST,AD-1,CS
290 END
900 DATA160032150115160068160060
160032BDB3EDD76FBE4013BC40152418
A680AD9F,2607
901 DATAA002966F26F1AD9FA00027EB
AD9FA00027FA20E3398D2D8E7FFF9F17
8E40299F,3863
902 DATA048D219E04BF1202BF12C89F
069F08308904009C1723029E179F139F
15DC0483,2591
903 DATA4029204E3404C64020033404
5F1F9B35848E4029BF4004398DEAE684
EE029E04,2792
904 DATA308904009C17242F108E0EBB
A6C03404847FC6FE810D270C8020250E
813F2502,2570
905 DATA8020E6A61F985D1703C63504
5A26DDCCFFFF8DB67EB4F44F5F20F7FF
2D313429,3944
906 DATA803A2B2F3280802C233C3D36
3733212A303527263B2E3E80808039B0
43594E49,2235
907 DATA414D5A54464B4F525C4C5856
574A4550475E535D5551808080258O0F
6215D805,2685
908 DATA2102900DFC13DB04A902550C
44116B0417020B09730D6A03260193BD
B3ED8608,2365
909 DATA3D8E0EFB3AEC84FD1131EC02
FD1158EC04FD1043FD1064EC06FD1092
7FFF4017,3880
910 DATAFF228E03004F6F804A26FB0F
02CCFEF8DD000F0A0F0B8E13739F0E9F
260F220F,2820
911 DATA230F1D8E0420CC6060ED818C
060025F98E05E09F0C86BFA7848E05A0
9F24869F,3412
912 DATAA7841A50170087D62326048D
1620F51CAF17FED6AD9FA00026FAFC40
15B34013,3367
913 DATA16FF0F9E26A6862B3A1F8981
602502C0408D50816026028D449E24A7
808C05C0,3098
914 DATA251A8E0420EC8820ED818C05
A025F6CC6060ED818C05C025F98E05A0
9F24869F,3779
915 DATAA784394C260CC60D8D198660
A79F402420D04C26058E139320064C26
058E1373,2615
916 DATA9F26399E159C172404E7809F
1539962227031700F496232701390F1E
0F1F0F1B,2156
917 DATAC6138D78DC1A8152250721FE
5A2A0A20DD5C2B022003CC007FD71B4F
D61AD31E,2966
918 DATADD1E8300002406AC01AC0120
D3DD1E86059720CC0013971B971C8D40
4FD61AD3,2901
919 DATA1EDD1E830000240FDC1A8152
C900D71B0C1C12C61220E3DD1ED61B58
D11C0621,2752
920 DATA0A2026CFAC94C6088D124FD6
1AD31EDD1E83000025EE962144444439
8D4C4FD3,3140
921 DATA1EDD1ECC00028D42CB028D3A
CB028D36D71AC059502B022003CC0000
C10F2202,2628
922 DATA2003CC000FD11D26063D3DAC
8B20138E0410A68584BFA785961DD71D
E686CA40,3157
923 DATAE78617012639AC01AC018601
5CC1602504A1012005B5FF2027F25CC1
602504A1,2918
924 DATA012005B5FF2026F2398E0405
CE142BA6C0A7808C040D25F7CC343CF7
FF21B7FF,3646
925 DATA018602B7FF200F1E0F1F9E06
9C042724CC0000DD1186059720E6809F
06D7215F,2727
926 DATA8D54AC94CC00085A26FD0421
8D480A2026F2EC9B3DAC8BCC0000DD11
538D3796,3344
927 DATA2226C7CC343CB7FF21F7FF01
8E0405CE1423A6C0A7808C040D25F739
B6FF208A,3731
928 DATA02B7FF20862A971039B6FF20
84FDB7FF2086279710392404 8DE22004
8DEB2000,3444
929 DATA801D4A26FDB6FF2088FCB7FF
20D6104FD31EDD1E931124088D0F9610
802320E2,3601
930 DATADD1E39AC943DAC0139960226
7CDC00C037498A0124022003CCFEF8DD
008E0300,3057
931 DATA3AB7FF02B6FF008A801F89E8
84E48421FEA7848607DD029E049C0626
C69C0826,3805
932 DATAC48E00009F069F089F043996
02263ADC00C037498A0124022003CCFE
F8DD008E,2959
933 DATA03003AB7FF02B6FF008A801F
89E884E48426BEA78496014C27088B37
970121FE,3530
934 DATA20818607DD0216FF7A4A9702
D601CB08D7010403247D867FB7FF02B6
FF008440,3295
935 DATA27058E13B320058E13EB2000
A685E6852B289E04980AD70A84602609
C41FE780,3004
936 DATA3D21FE2012C5402604861B20
04861F2000C41FED81A1019F04399E04
5C260E96,2526
937 DATA0A8440970ACC0004E7803D20
EA5C260BCC0802A780ED81A18B20DC5C
2649D622,3280
938 DATA270D8E40299F068E00009F04
9F08393DAC8B39D60B2747C004D70B8E
05E03AEC,2844
939 DATA84ED88E0CC6060ED81EC84ED
88E0CC6060ED84D60B27043DAC84398E
05E09F0C,4453
940 DATA86BFA78421FE395C26060322
AC843D395C26070F220323AC84393DAC
01399E08,2605
941 DATA9C042607CC000C5A26FD39A6
809F089E0EA6862B129E0CA7808C0600
24139F0C,2690
942 DATA86BFA784AC8B394C260F1286
60A79F400C8620970B3D3084394C2609
8E13939F,2987
943 DATA0EA101200B4C26078E13739F
0E20013D3D12398045FF416053495580
44524A4E,2303
944 DATA46434B545A4C57485950514F
4247FE4D5856FD8073FF6D605E787780
6474676C,3436
945 DATA617A68756269726376707179
7F66FE6E6F7BFD8043594E49414D5A54
464B4F52,3457
946 DATA5C4C5856574A4550475E535D
5551258080FDFF363733212A30352726
382E3E2C,2581
947 DATA233C3DFEFCFB808080808080
43594E49414D5A54464B4F525C4C5856
574A4550,3262
948 DATA475E535D5551258080FDFF80
2D313429803A2B2F3280808080839FE
FCFB8080,3659
949 DATA8080805245434549564560545
52414E534D4954000000000000000000
00000000,1621
950 DATAX,0
```

As far as transmitting goes, I have raised the spectre of "spectral purity" of the CoCo audio output in the past. I would limit this version of computer-generated AFSK to VHF. A less-than-perfect sine wave fed into a sideband transmitter often produces spurious signals. To use this on HF, I propose a strictly theoretical solution. Try directly feeding a one-chip AFSK generator, based on one of the function generator chips that outputs a pure sine wave, with a simple PLL decoder, such as the ones presented here in months past. It may not be elegant, but it's cheap and purifying.

Receiving Hardware

You may have to add a stage of external limiting to the audio input. Try a pair of 1N914s across the receiver output back-to-back. Figure 1 is a simple way of doing this. Similarly, the audio output of the CoCo may exceed the mike gain of your transmitter. A resistive attenuator may be required in that instance. Play with the values. You won't hurt anything as long as you're careful.

The cassette relay is used to switch the system from transmit to receive. If there isn't too much voltage on your PTT line, (there shouldn't be with most VHF rigs), you can switch the PTT line directly with the relay. Otherwise, use the cassette relay to key another relay to key the transmitter.

After loading and RUNning RTTY.BAS, you will see a menu with an arrow, moved with the up and down arrow keys, to select the various options. Hit ENTER> to select an option. Those choices with various responses, such as speed, will scroll through each time you hit ENTER>.

With the listings taking up space this month, I think I will pull in the reins rather than give short shrift to some of the topics raised in recent mail. We'll hold that for some of the long winter nights ahead. In the meantime, feel free to reach me on Delphi (MARCWA3AJR), CompuServe (75036,2501), or good old US Mail (enclose a SASE for a reply). See you in February's RTTY Loop! 73

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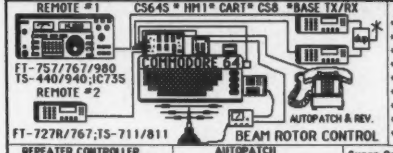

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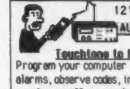

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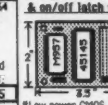

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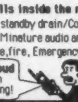

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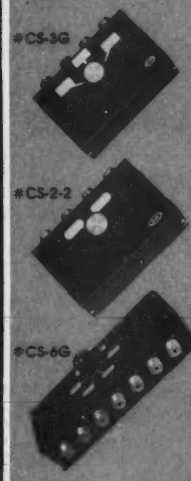

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Ham Doings Across the Country

Special Events listings will be provided by 73 magazine free of charge on a space-available basis. Announcements must be received by us by the first of the month, two months prior to the month in which the event takes place (by March 1, for example, for a May or later event). Please mail to Editorial Offices, 73 Magazine, WGE Center, Peterborough NH 03458.

SOUTH BEND IN
JAN 3

A Hamfest Swap and Shop will be held on Sunday, January 3, 1988, at Century Center, downtown on U.S. 33 ONEWAY North between the St. Joseph Bank Building and the river, South Bend, IN. Four-lane highways to door from all directions. Tables: $5/5ft. Round. $15/8x2.5 Rectangular; $20/8ft. Wall locations. Talk-in Freq: 52-52, 99-39, 69-09, 34-94, 145,29. For more information contact *Wayne Werts K9IXU, 1889 Riverside Dr., South Bend, IN 46616, (219/233-5307).*

MILWAUKEE WI
JAN 9

The 16th Annual Midwinter Swapfest will be held on Saturday, January 9, 1988 at the Waukesha Co. Expo Center Forum from 8 AM till 3 PM. Directions: I-94 to Co. J, south of FT, west to Expo. Admission: $2 in advance, $3 at door. Tables (4 ft.): $3 in advance, $4 at door (electrical outlet $5, as available). Advance deadline January 2, 1988. Dealers welcome. Amateur exams given—write for details. Fine food served at our usual low prices. Sponsered by the West Allis Radio Amateur Club. For tickets or information write: *WAREC Swapfest, P.O. Box 1072, Milwaukee WI 53201 (SASE Please).*

MORRISTOWN NJ
JAN 9–10

To commemorate the 150th anniversary of the first public demonstration of the eletromagnetic telegraph, January 11,1838, by Samuel F.B. Morse and Alfred Vail; the AT&T Bell Labs Whippany Amateur Radio Club and the Bellcore Pioneers Amateur Radio Assn. will operate W2TW on January 9, 1300Z - January 10, 0100Z and January 10, 1300Z-2000Z from Historic Speedwell Iron Works. SSB operation will be in the lower 25 KHz of the General 80, 40, 20, 15 and 10 meter bands, 144.220 MHz, 146.58 MHz FM. CW operation will be in the lower 25 KHz of the General 80, 40, 20, 15 and 10 meter bands. Novice CW operation will take place the first 15 minutes of each hour in the 80, 40, 15, and 10 meter Novice bands, and 10 meter Novice phone. Three HF stations on the air covering all bands. For special QSL card, send QSL and business SASE to K2ASM via callbook.

BETHEL CT
JAN 9–15

In conjunction with National Bicentennial of the Constitution activities and the special "We the People" WAS Award, the Bethel Educational Amateur Radio Society (BEARS), will be operating KZ1Z (KZ200Z), on all HF frequencies, using SSB, CW, Packet, RTTY and SSTV modes, in both the General and Novice portions of the bands, during the week of January 9–15, 1988. QSL, with a SASE, to: BEARS, Bethel Middle School, 1 School Street, Bethel CT 06801.

HAMMOND LA
JAN 16

Southeastern Louisiana University ARC and SELARC will hold its annual Hamfest at Southeastern Louisiana Univ. Doors open 9 AM–3 PM on Saturday the 16th. Admission is free. The first table is free. Extra tables are $5. Talk-in on 146.4/147.0. Food and drinks available, dealers, technical and informative forums, and QRRL VE exams. Pre-register for exams by sending Form 610, copy of license, and check for $4.35 to SELARC. Contact: Joe Magro WO5R, 534 Iverstine Lane, Hammond LA 70401.

FORT MYERS FL
JAN 23

Announcing the City of Palms Hamfest. To be held at Moose Lodge Hall #1899, 1900 Park Meadow Drive, Fort Myers FL on the 23rd of January. Talk-in on 146.28/88 (W4LX). Doors open at 9 AM. Tables are $10 each and tickets are $3. All reservations should be made before Dec. 15, 1987. Please make check payable to "FMARC". Mail to N.M. Cornwell, Jr., Fort Myers Amateur Radio Club, PO Box 4814, North Ft. Myers FL 33918-4814. Or call 813/332-1503.

SOUTHFIELD MI
JAN 24

The Southfield High School Amateur Club is sponsoring their 20th Annual Swap and Shop on January 24, 1988, at Southfield High School, 24675 Lahser, Southfield MI 48034. Doors open at 6 AM for exhibitors. Open to the public at 8 AM to 3 PM. Admission is $3. Reserved tables are $20 for two 8-ft. tables (paid in advance). Additional reserved tables $10 each. Tables will also be available at the door. Lots of parking, food and door prizes. All profits from this affair will go toward Electronic Scholarships and to support the activities of Southfield High School's Amateur Radio Club. For more information and/or reservations, write to: Robert Younker, Southfield High School, 24675 Lahser, Southfield MI 48034.

INVERNESS FL
JAN 30

The Eighth Annual Citrus County Hamfest sponsored by the Sky High Amateur Radio Club will be held January 30, 1988, at Inverness FL. All functions will be held inside the 10,000 sq. ft. airconditioned auditorium at the county fairgrounds, 4 miles south of Inverness on US Route 41. The building will be open to vendors at 7 AM and open to the public at 9 AM. Ham gear, new equipment, surplus items, rare parts and computers will be featured. Tables are $5, not including admission. Admission is $3 advance and $4 at the door. XYLs admitted free with OM. Food and drink available. Talk-in on 146.355/955. For more information or tickets call Bob Gordon at 904/628-5045 or write SHARC Hamfest, PO Box 572, Lecanto FL 32661.

MARSHALL ISLANDS
JAN 30–FEB 8

The Kwajalein ARC will operate KX6BU from 0600Z January 30 until 0600Z February 8, 1988, to commemorate the 44th anniversary of the battles of Kwajalein and RoiNamur. Frequencies: SSB, 14.250, 21.350, 28.550: CW, 7.050, 14.050, 21.050, 28.050. For $7 KX6BU will issue a QSL, a certificate and a 64-page book on the battles. $3 will bring the QSL and certificate. All requests should be to KX6BU, PO Box 444, APO San Francisco CA 96555.

WHEATON IL
JAN 31

Wheaton Hamfest '88, The Odeum, Villa Park IL. Contact Wheaton Community Radio Amateurs, PO Box QSL, Wheaton IL 60189. Information Phone: 312/629-8006. Tickets are $4 advance with triple prize stubs. $5 at the door. All tables reserved.

YONKERS NY
JAN 31

The Yonkers ARC is sponsoring their Winter Electronics Fair at Lincoln High School on Kneeland Ave., in Yonkers NY. Admission is $3, children under 12 are free. Sellers tables $10 or a $1 a foot, if you bring your own table. Registration in advance for club-provided tables (limited number available). Doors open for sellers at 8 AM; doors open for buyers at 9 AM. Fleamarket hours are from 9 AM to 3 PM. Absolutely no tailgating will be allowed. Talk-in on 146.865 MHz or 440.150 MHz. For more information, contact Otto Supliski WB2SDQ after 5 PM at 914/969-1053.

1988 OLYMPIC GAMES
ALL FEBRUARY

Operators, K6ELX/VX6 and KB6IUA/VX6, employees of ABC's Wide World of Sports will operate from Calgary during the month of February 1988. SSB and CW 10m - 80m and FM on 2m and 220. For special Olympics QSL, PSE QSL via the bureau attention K6ELX or direct to the operators' addresses: K6ELX/VX6 Elliot Block, PO Box 486, Hollywood CA 90028 or KB6IUA/VX6 Chuck Pharis, 9604 Hillhaven Avenue, Tujunga Ca 91042. For direct QSLs a number 10 SASE is a ermust.

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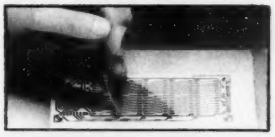

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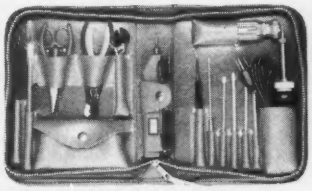

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A YEAR WITH HAMSATS

Since the first HAMSAT column one year ago this month, I have reported on many amateur satellite topics, such as tracking methods, station profiles including mobile systems, information sources, satellite specifications and activity updates. Much of this information is still valid and useful. If you're new to satellites, check these back issues!

Telemetry

Satellite telemetry, or the report the satellite makes about its general condition, is the only way ground-control stations can monitor the vital signs of our rather remote and inaccessible repeaters in the sky. Once an amateur satellite is launched, it is out of reach for life. By analyzing telemetry data such as temperatures, voltages, currents, power levels and other information, the lifespan of the satellite can be extended if control functions were built into it.

OSCAR 1 was designed with a projected lifespan of 30 days. Even with such a short life expectancy, the designers and observers wanted some form of feedback. The 145-MHz beacon transmitted "HI" in CW. The onboard oscillator (a two-transistor astable multivibrator) incorporated thermistors that would vary the clock rate with changing temperature. By counting the number of times the "HI" was sent each minute, the satellite's temperature could be calculated using a graph or simple formula.

Although today's amateur satellites are far more complex than early OSCARs, we still use feedback for data collection and spacecraft control. Receiving and decoding telemetry sent from the satellite provides insight to the state of affairs onboard the orbiting hamsat.

All amateur radio satellites have used CW for beacons, and most have employed it for their primary method of communicating telemetry data.

UOSAT-OSCAR-9 and -11 are rarely heard transmitting anything except 1200-baud ASCII, but they are both capable of CW at 10 or 20 wpm. They can also generate four other ASCII speeds, 60-wpm RTTY, and a Digitalker voice synthesizer experiment.

The telemetry from Fuji-OSCAR-12 is 1200-baud Manchester-encoded bi-phase PSK (Phase Shift Keying) when in the "JD" or digital mode. However, when in the analog or "JA" mode, CW telemetry reminiscent of AMSAT-OSCAR-8 can be heard on 435.797 MHz.

AMSAT-OSCAR-10 has a software-driven telemetry system capable of any digital code. Morse, RTTY, and PSK were the most common forms heard on the general beacon. Today, even though the satellite is still functioning, the loss of the computer memory has made telemetry impossible. There is only a steady carrier or nothing at all on the beacon frequencies. This type of system, using software to configure the telemetry, will be used on Phase 3C, but with the more expensive radiation-hardened memory chips.

If you'd like to try decoding telemetry, RS10/11 provides full-time CW data on frequencies you can hear with simple and inexpensive equipment.

Since their launch in June 1987, this system, including the host satellite, COSMOS 1861, has provided thousands of contacts for hams around the world. Modes A and K are used more often because there is desense of the 150-MHz command receiver onboard COSMOS 1861 whenever the RS units are switched to Mode T (because of its two-meter output). This leaves the 10-meter downlink as the most commonly-heard signal. Since up to one Watt of output power is allocated to the beacon frequencies, the CW telemetry can be heard by any reasonable 10-meter receiver hooked up to a dipole antenna, or even a piece of wire along the ceiling.

The frequencies used for telemetry are usually 29.357 MHz for RS-10 and 29.407 MHz for RS-11. The CW is relatively easy to copy, but uses a mix of letters and numbers that may cause some confusion. It is best to tape record the signals and play it back later to ensure accuracy.

A complete frame of data includes 16 blocks, each with two letters followed by two numbers. The satellite identifier (RS-10 or RS-11) precedes and follows each complete frame. A sample of actual telemetry as received from RS-10 in early November is shown at the top of Figure 1.

Earlier RS and ISKRA spacecraft used similar data formats. In these satellites, the letters simply designated the channel being sampled. For RS-10/-11 the letters are used to define the status of various systems onboard the spacecraft. Previous satellites used numbers to define voltage, temperature and other readings taken from sensors on the satellite. This has not been changed. The lower portion of Figure 1 shows the information obtained when all the letters and numbers in the upper portion have been decoded.

Decoding a single frame of data provides a snapshot of conditions onboard. Decoding several frames during a pass gives a moving picture view of the satellite's systems. Voltages and temperatures may fluctuate as the satellite moves from sunlight to darkness. Watching frames from consecutive orbits may show modifications implemented by ground control stations in the Soviet Union to the transponders and beacons in the satellite.

Next time you are on RS-10/-11, check the beacon frequency and collect a few frames of telemetry. To convert the raw telemetry blocks to functional form, use Table 1. As an example of how to use the table, find Block 9 in the raw telemetry from Figure 1. It

```
RS10 raw CW telemetry:

RS10  NS81 NR00 ND10 NG45
      NU45 IW00 IK00 I000
      AS36 AR27 AD40 AG35
      MU00 MW46 MK46 A089

RS10 telemetry after decoding:

Data sampling period is 10 minutes.
20 dB receive attenuator is out.
10 dB receive attenuator is out.
15 Mtr receiver is on.
2 Mtr receiver is on.
Special service channel is off.
10 Mtr beacon power is 1 Watt.
2 Mtr beacon power is 1 Watt.
First memory board is off.
Second memory board is off.
Special channel memory status is open.
Code store memory status is open.
Memory output is to 10 Mtr beacon.
15 Mtr ROBOT rcv. atten. is off.
2 Mtr ROBOT rcv. atten. is off.
Special service ch. xmtr pwr is 1 Watt.

Main power supply voltage is 20.25 Vdc.
2 Mtr power output is 0 Watts.
10 Mtr power output is 1 Watt.
15 Mtr receiver AGC voltage is 9 Vdc.
2 Mtr receiver AGC voltage is 9 Vdc.
Special channel rcvr voltage is 0 Vdc.
10 Mtr command mode is off.
2 Mtr command mode is off.
10 Mtr xmtr temp. is 26 deg. C.
2 Mtr xmtr temp. is 17 deg. C.
Main PSU temp. is 30 deg. C.
9V rcvr PSU temp. is 25 deg. C.
Backup receiver voltage is 0 Vdc.
15 Mtr ROBOT rcvr IF voltage is 9.2 Vdc.
2 Mtr ROBOT rcvr IF voltage is 9.2 Vdc.
Robot QSO counter shows about 80 QSO's.
```

Fig. 1. Raw and decoded RS-10 telemetry.

reads "AS36". Checking with Table 1, the letters portion of the block show that the first memory board is off. When decoded, the numerical portion of the block yields the temperature, in degrees Celsius, of the ten-meter transmitter. Using the equation T = (N - 10), where T is the decoded temperature and N is the two-digit number in Block 9, the result is a comfortable 26 degrees C.

A few of the telemetry blocks require explanation. The receiver attenuators referred to in the letter status indicators for Blocks 2 and 3 can be used in combination giving four possible signal input levels instead of three. By using them together, as much as 30 dB of receiver attenuation can be switched in. Other configurations are 0-, 10- or 20-dB attenuation. The ROBOT receiver attenuators shown in Blocks 14 and 15 are only single-stage 10-dB types.

The ROBOT QSO counter noted in the number conversion column of Table 1 is quite different from those in RS-5 and RS-7. In the earlier satellites, the telemetry presented the number of contacts logged by the autotransponder. The number could increment to a maximum of 99. With RS-10/-11, the counter will show "00" until at least 32 QSOs have been made. At that point the telemetry number in Block 16 will show "80". As the counter approaches "99", the actual number of loggings will be rising from the thirties up to 128, the maximum number of callsigns the memory will hold. Before the memory is filled up, the ground control station will download the list of callsigns worked by the ROBOT.

A slightly modified form of telemetry may be heard if you listen while a command station has access to the satellite. All of the leading letters in each block will have an extra dot or dash added. If the command station is accessing via 15 meters, a dot is added, turning an I to an S, or an N to an R. If the control station is on two meters, the I will become a D and the N will change to G. This also applies to the other leading letters. Here in the states, the modified telemetry will be hard to hear since there are no western-hemisphere command stations. However, with enhanced ten-meter propagation, it may be possible to monitor the downlink while the satellite is over the Soviet Union.

"Certain blocks of the RS-10/-11 telemetry can be quite useful."

Decoding telemetry may seem to be only a tool for ground controllers or a curious exercise for serious satellite chasers. This is not the case. Certain blocks of the RS-10/-11 telemetry can be quite useful even for those interested only in making contacts through the transponder. A quick look at the letters in Blocks 4 and 5 will indicate which radio to use for the uplink. In Figure 1, these two blocks showed "NG" and "NU" respectively. From Table 1, note that these letter status indicators state that both the 15- and two-meter receivers are active. Instead of testing an uplink band to see if it is being received by the satellite, a quick look at the telemetry can save time.

Another group that finds the telemetry useful are those in education. What better way to explain orbital mechanics to high-school students, than to actually predict orbits and then listen to a satellite and decode its telemetry?

More information on the telemetry of the other hamsats can be found in the Satellite Experimenter's Handbook by Martin R. Davidoff and the JAS-1 Satellite Handbook. Both are available from AMSAT. A computer program for the PC and PC compatibles is also available from AMSAT. It will capture and decode U-O-9 and -11 telemetry when used in conjunction with a modem and two-meter-FM receiver.

Block #	Letter Status Indicators	Number Conversion Equations
1	IS - Data sampling per. is 90 min. NS - Data sampling per. is 10 min.	Main (20 Vdc) power supply voltage V = N/4 Vdc
2	IR - 20 dB rcv. atten. is in. NR - 20 dB rcv. atten. is out.	2 Mtr transponder power output P = N/10 Watts
3	ID - 10 dB rcv. atten. is in. ND - 10 dB rcv. atten. is out.	10 Mtr transponder power output P = N/10 Watts
4	IG - 15 Mtr receiver is off. NG - 15 Mtr receiver is on.	15 Mtr receiver AGC voltage V = N/5 Vdc
5	SU - 2 Mtr receiver is off. NU - 2 Mtr receiver is on.	2 Mtr receiver AGC voltage V = N/5 Vdc
6	IW - Special service channel off. NW - Special service channel on.	Special service channel voltage V = N/5 Vdc
7	IK - 10 Mtr beacon power is 1 W. NK - 10 Mtr beacon power is 0.3 W.	10 Mtr command mode on/off 00 = OFF, any other numbers = ON
8	IO - 2 Mtr beacon power is 1 W. NO - 2 Mtr beacon power is 0.3 W.	2 Mtr command mode on/off 00 = OFF, any other numbers = ON
9	AS - First memory board is off. MS - First memory board is on.	10 Mtr transmitter temperature T = (N - 10) deg. C.
10	AR - Second memory board is off. MR - Second memory board is on.	2 Mtr transmitter temperature T = (N - 10) deg. C.
11	AD - Special channel mem. open. MD - Special channel mem. closed.	Main (20 Vdc) PSU temperature T = (N - 10) deg. C.
12	AG - Code store memory is open. MG - Code store memory is closed.	9V receiver PSU temperature T = (N - 10) deg. C.
13	AU - Memory output to 10 Mtrs. MU Memory output to 2 Mtrs.	Backup 9V PSU voltage V = N/5 Vdc
14	AW - 15 Mtr ROBOT rcv. atten. in. MW - 15 Mtr ROBOT rcv. atten. out.	15 Mtr ROBOT receiver IF voltage V = N/5 Vdc
15	AK - 2 Mtr ROBOT rcv. atten. in. MK - 2 Mtr ROBOT rcv. atten. out.	2 Mtr ROBOT receiver IF voltage V = N/5 Vdc
16	AO - Special Ch. power is 1 W. MO - Special Ch. power is 0.3 W.	ROBOT QSO counter: 0-32 QSO's=00 32-128 QSO's yields 80-99

Fig. 2. Telemetry decoding definitions and equations for the RS-10 and -11 satellites.

Updates

A-O-10 was released for guarded use in mid-November. The batteries appear to be in good shape and the Mode-B transponder is working well. The DX is out there! Check the AMSAT nets for scheduling since there is some rather serious eclipsing and satellite activity must be avoided during that time.

FO-12 continues with a mix of JA, JD and recharge time. Recent schedules have worked well. Once again, check the nets for the latest information. 73

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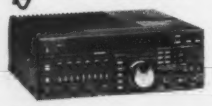

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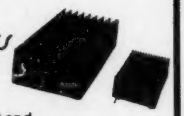

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73 INTERNATIONAL

Edited by Richard Phenix

73 INTERNATIONAL BEGINS 6TH YEAR

April, 1983: Listing nations in world geographic order, from East to West (a silly idea soon dropped—the starting point wasn't even the International Date Line), the first International section appeared with news from India (VU2CZ), Hong Kong (VS6HJ), Taiwan (BV2A/BV2B), Republic of Korea (HL9KT/KH2AC), Papua New Guinea (P29NSF), Guam (KH2AR), New Zealand (ZL2VR), Chile (CE3GN), Brazil (PY1CC and PY1APS/PY7APS), Switzerland (HB9MQM), Federal Republic of Germany (DJ8BT and DJ3NW), Austria (OE3REB), and Sweden (SM0COP). Seven of these countries continue to write in often and regularly, and ZL2VR, PY1CC, PY1APS, DJ3NW, and SM0COP are still faithful representatives for their nations. Other faithfuls came soon: Australia (VK3YJ), Czechoslovakia (OK3KFO ARC), Greece (SV1IW), Israel (4Z4MK), to name those both faithful and frequent.

There were 38 nations appearing in the section in 1983, and to date a total of 71 countries have appeared. Some places, like Antarctica, showed up only once. Others dropped out when their correspondent moved (Liberia) or became too involved in other activities (Papua New Guinea), and no replacement took over. (The International Editor offered to go find replacements, but the travel budget didn't permit, and his reasonable suggestion that money be found by publishing only ten issues of the magazine each year was rejected for some reason.) Five new nations joined the International Club in 1987.

We look forward to more nations in 1988. New correspondents will receive courtesy subscriptions to *73 Amateur Radio* in return for a minimum of four columns over a 12-month period. Let's hear from you!

Reminders! Deadlines: Your material must be received by the **first** of a month to be considered for inclusion in the issue for two months later. **January 1** for the **March** issue, for example. *But short items or FLASH news items ("Ham QSOs mysterious object in space....") probably can be slipped in if received by mid-month.* Do not ever write on the backs of photographs! Photos cut out of other magazines, newspapers, etc., cannot be used, for technical reasons. Type your material and double-space it. Two to three pages (double-spaced) is long enough.

NOTES FROM FN42

73 International begins a new service this month: to hams who plan to visit other countries and want to operate while traveling. See details elsewhere!

January First is Happy: New Year, Nouvel An, Neujahr, Ano (with a wiggle over the n) Nuevo; there are Independence Days for Haiti on the 2nd, Burma on the 4th, and Nauru on the 31st. And a few more celebrations to mention during the appropriate DX contacts: January 7—Ethiopian Christmas; 9—Martyas Day, Panama (Nepal has this on the 29th); 15—Adult's Day, Japan; 20—National Heroes Day, Guinea-Bissau; 24—Economic Liberation Day, Togo; 25—National Holiday, Australia; 26—Anniversary of the Proclamation of the Republic, India.

BRITISH WEST INDIES MONTSERRAT

Errol "Bobbie" Martin VP2MO
PO Box 113, Plymouth
Montserrat, British West Indies
Leeward Islands, Zone 8

[The following concludes the report started in the November issue, in which VP2MO, now in charge of all amateur radio matters in the Ministry of Communications and Works, pointed out that operating on January 1, a holiday, is legal ("You bet your ever-loving COAX it is!") even though all licenses expire every December 31st and can't get renewed until January 2nd—and QSL cards dated on January 1st are valid for DXCC.]

The licensing authorities are aware of the situation and allow it to continue. To allow is to permit, right? And does this administration have anyone else to satisfy besides itself? Hell, no, and it couldn't care less what anyone else thinks. The administration has NOT declared anything about the operating to be illegal. Understand?

About those countries where operating amateur radio is itself illegal—outlawed: Our constant hope is that we all can educate them so that they become favorable toward amateur radio and eventually will become a part of this fraternity. There is danger that we are prolonging the wait for this conversion, however, in the way we comport ourselves in our day-to-day air contacts with each other. We are not doing a very good job as ambassadors.

Heck, we are fooling ourselves if we think the world isn't hearing us...it hears us...and what is heard is not too inviting. Trying to get through that pileup is fun—it's good for you to physically shout out all the tension that has built up at work, or wherever, but cussing the other guy out in public is not "meeting people and making friends."

I have heard the term "lid" used, and the tone of voice gave me an indication that it was not a good-morning greeting. We have just got to work on cleaning up our act if we are going to show the world what a good thing we have. If we want to make enemies all we have to do is go down the street and break somebody's window. We have a local saying, "You can shake a man's hand but not his heart." So all I ask is that we extend a hand, and if we are not too sure about it, keep your heart concealed. In other words, keep your garbage off the air, it doesn't belong there!

[I bet that in his DX contacts, VP2MO sends appropriate greetings from the "Notes from FN42" calendar section which always starts this column.—Ed.]

PEOPLE'S REPUBLIC OF CHINA

Chang Han Dong (BY4AOM)
Institute of Estuarine & Coastal Research
East China Normal University
Shanghai 200062
China

Han Dong sends the following hoping it will be "helpful for readers, particularly in the Western World, to understand about Chinese amateur radio."

In the five years since 1982, when ham radio activities were resurrected, about 30 ham stations were set up, one after another, and more and more people are interested in the hobby. Chinese amateur radio still has a long way to go to catch up with foreign countries.

As early as the 1930s, amateur stations appeared in China. Amateurs used transmitters made by themselves to contact each other and foreign stations. All of them worked in CW. However, these good times did not last long. The Second World War broke out, the great War of Resistance Against Japan (1937–1945) began throughout China. Many amateurs joined the war effort and gave of their full professional knowledge and skills. Postwar, some amateurs were cited for their distinguished service.

After 1945, amateurs began activity again, working in CW and AM phone, and the China Amateur Radio League (CARL) was set up. There were many advances made in amateur radio in those years. After 1949, however, owing to the situation at that time, amateur stations were called off temporarily. In the 1960s, BY1PK was on the air, and in 1982, the government declared that amateur stations were allowed to resume, and BY1PK and then other stations were set up. In Shanghai, some old men who had their own licenses before 1949 organized a club station, BY4AOM (Able Old Men).

All radio amateurs in China are united in CRSA—the China Radio Sports Association, and branches of CRSA are set up in every province and municipality directly under the Central Government. Its major tasks are organizing and planning amateur radio activities, approving license applications, QSL services, etc. Since we are new, we have no contests yet in China, but Chinese amateurs often join international contests, and CRSA often organizes CW contests, fox hunting (80m, 2m, 160m), and model ship and plane building. Ham stations in China are usually in touch with each other every Thursday on 14.330 MHz.

BY is the prefix for club stations, BG for private amateur stations (we have none at the moment, but

all the hams in China look forward to having BG stations on the air as soon as possible), and B7 is for special stations.

In China, the National Radio Management Committee (NRMC) corresponds to the American FCC, so applications for amateur licenses go to it for examination and approval. The CRSA now is drawing up the necessary laws and rules and regulations which will strengthen amateur station activities.

Among the some 30 stations are two university stations, the old-timer station (AOM), and some children's stations: BY1SK, BY4AY, BY4ALC, and so on. These are set up in the Children's Palaces, and the members are secondary school students who study elementary radio, English, constructing a receiver, and station operation. A recent report is that some young hams in the Chao Yian Children's Palace of Peking, under the leadership of their teacher, have made a kind of satellite receiver that can receive NOAA meteorological satellite signals of the USA, and the polar-orbiting meteorological satellite of Japan.

There are many radio direction-finding contests (RDFs) and model plane and ship contests, and the West Lake Cup RDF invitational tournament every year. Also, BY1PK (Peking) and BY4AA (Shanghai) provide the Hong Kong-to-Peking automobile race and international marathon race with their communications services. In 1985, BT0NMN joined the China/Japan Mount Namunani United Mountaineering Expedition. [See *73* International, August, 1987.]

Amateur stations resumed in Taiwan also, around 1983. There are about 20 stations there, now, some of which had licenses before 1949 when they lived on the mainland of China. BV is the Taiwan prefix, and many times I have tried to make QSOs with them and always met with defeat. Later I learned that the Taipei government does not permit BV stations to contact BY stations. I think (hope) this will change soon.

American hams and Japanese hams have given much help to Chinese amateurs. They have presented transceivers and antennas and have conducted many training courses, helping the Chinese hams to understand new technologies—we are very thankful. Owing to the years that activity was suspended, we have fallen far behind in techniques, experience, equipment, and education. I received a letter from a secondary school student in Peking the other day. He said, "I am very interested in ham radio, but I don't know how I can do and I am short of direction [guidance] ...."

The Chinese often say: *Everything's hard in the beginning,* but there also is a proverb in China that says "It all depends on human effort."

GREAT BRITAIN

Jeff Maynard G4EJA
32 Waldorf Heights
Hawley Hill
Camberley GU17 9JQ
England

THE UK SCENE

This morning I was looking for some information on satellite orbital parameters. Needless to say, just when I wanted it all my available information was out of date. After spending a few minutes cursing my own poor filing system, I remembered that an alternative source of information lay on my desk.

I refer to my "Displayphone," which as well as being a fully-equipped telephone can act also as a simple data terminal. In particular, it serves as a monochrome-only Viewdata terminal. (You will recall that Viewdata—called Prestel in the UK—operates using a V23 modem with asymmetric transmission speeds of 75 and 1200 bits per second.) Although Viewdata graphics are crude by modern PC standards, my interest for data only should have been satisfied easily. I decided, therefore, to access the Radio Society of Great Britain (RSGB) mailbox. This is open to anyone with a compatible (V23) terminal by dialing the UK number, 0707 52 242 (from the US, 1 44 707 52 242).

I must confess that I was not completely sure that my needs would be met. Previous experience with other Viewdata systems had left the feeling that information was seldom up-to-date and that routings (the linkages between "pages" of display material) were often incomplete. I should say at once, therefore, that the RSGB scores very well on both counts. Information which I retrieved was only 24 hours old in some cases, and in no case did I find myself lost because of missing or incomplete routings.

It had been some time since I used the RSGB service, and my first impression was of the much wider range of topics covered. The main index lists (among many items) band plans, diary dates, club information, repeaters, and beacons. It was to the last that I turned now. Again I was impressed by change: the continued expansion of the packet repeater network. I noticed that GB3UP in Guilford is operating within range of my home (on 144.650 MHz, in common with most other packet repeaters). I intend to access it in due course and will report on it here.

Incidentally, anyone particularly interested in packet and/or digital radio might like to consider subscribing to the RSGB latest newsletter, *Connect International*. It is published on the 15th of each month and is available on subscription to members and non-members, with airmail available outside of Europe.

After browsing through a wide range of topics across many, many pages of information (the format is generally such that one can regard the display as giving information rather than just data), I remembered my original need—the satellite orbital data. The satellite sub-index lists a whole range of topics covering basic background information through to fairly up-to-date news about this exciting technology. There also are orbital predictions for the next month or so, together with Keplerian elements (for the keen ones with a powerful PC!). These are available for the OSCAR and RS series, MIR, Salyut, and Ajisai. My original need was well satisfied, with extensive and up-to-date information!

ITALY

Mario Ambrosi I2MQP
Via Stradella, 13
20129 Milan
Italy

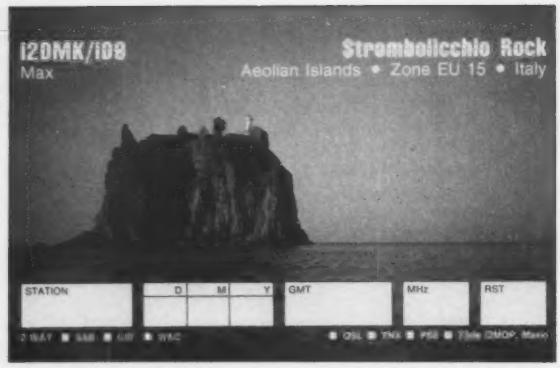
The Italian Island Award (IIA) started its life about four years ago. Since then, more than 200 have been issued, most of them to Italian amateurs—only 10 have gone to US hams. To get it, DX operators must get confirmation of contacts from 15 islands, situated in at least three groups of Italian islands. Stickers are available for mode (SSB, CW, MXD) and band.

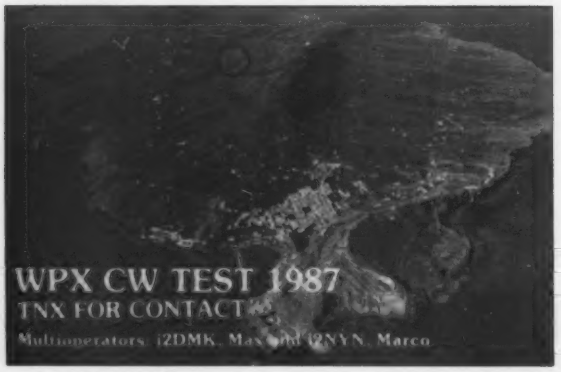
Honor Roll is available if you contact 80 islands in at least 13 groups, and a nice plaque, the AIIA (All Italian Island Award), is issued for 150 islands and 17 groups. As of today [September, 1987] there are 248 islands on the list (available for SAE plus IRC) located in 18 groups, but the number can increase if there is activity from other islands.

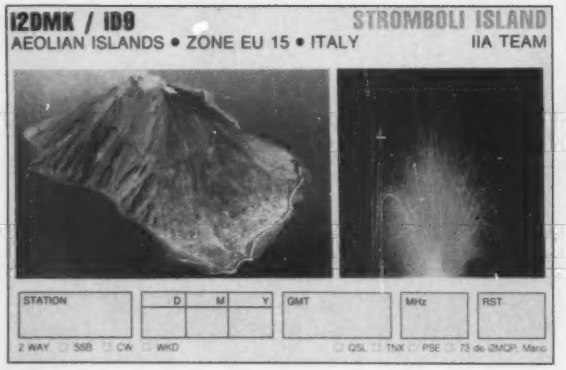
The cost of the award is US$5 or

I2DMK and Italiano Honor Roll Award.

I2BVS and his son, I2NYN.



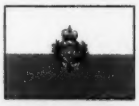




Italian Island QSL cards.

10 IRCs; the stickers can be sent for an SAE plus IRC; the plaque is US$30, postpaid.

There is quite a lot of activity all year long, but mainly during the good season, around these awards. In 1986, more than 40 expeditions took place, and 1987 totals probably will be about the same. You should know about a few of the most active people. First is Max I2DMK, for whom I am QSL Manager. He has activated more than 30 islands up to now, and the QSL cards are much in demand. He is a journalist and owns a small company which publishes three magazines devoted to sports (particularly to skiing), and he goes on the DXpeditions with his son, Marco I2NYN and an old friend, Enzo I2BVS. They are mainly on CW, but they also like some phone operation.



SAN MARINO

Do you have any T7 cards and don't know where to send them? Here is a short list of San Marino addresses; I hope you can find what you want.

To all addresses except the one indicated, add "47031 Republic of San Marino." (47031 R.S.M. is adequate locally. [*And if you wish to be exactly accurate, the official name of this independent, 24 sq. mile, 23,000 population nation which is entirely surrounded by Italy, then add, "47031 Most Serene Republic of San Marino."—Ed.*]

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T77C Tony Ceccoli, Via Delle Carrare 67, Murata
T77D Giovanni Mario Reffi, Porta San Francesco, San Marino
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T77F Henry Franciosi—via I2WWW, ARI, Via Scarlatti 31, 20124 Milan, Italy (Do not add 47031 San Marino!)
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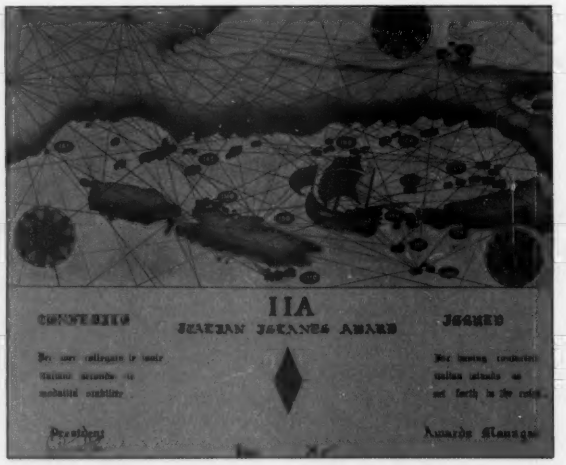

The Italian Islands Award issued for working 15 islands in three groups. Only ten awards have gone to U.S. hams.

INDEX FOR *73* INTERNATIONAL

From April 1983 (4/83) Through December 1987 (12/87)
(Including "Roundup" and "Notes from FN42" References)

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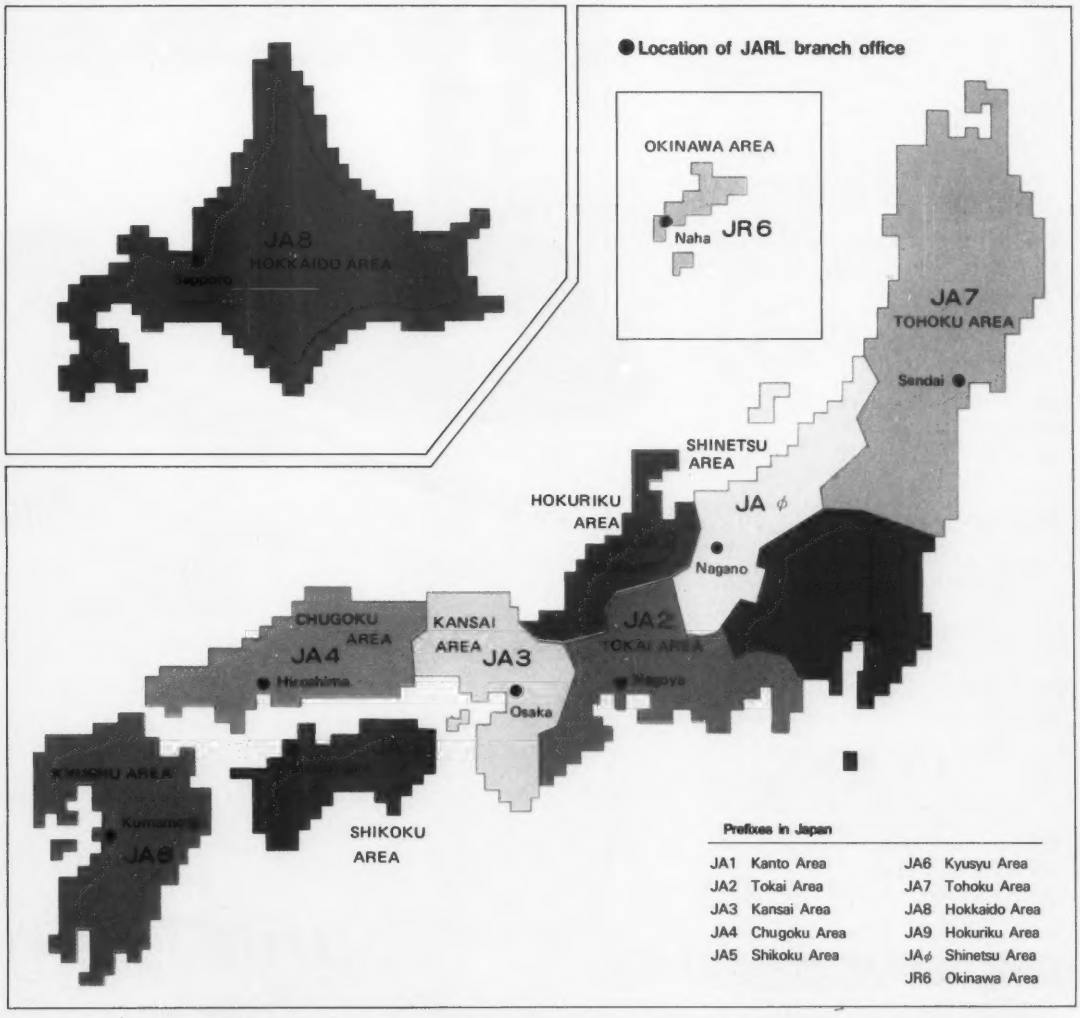

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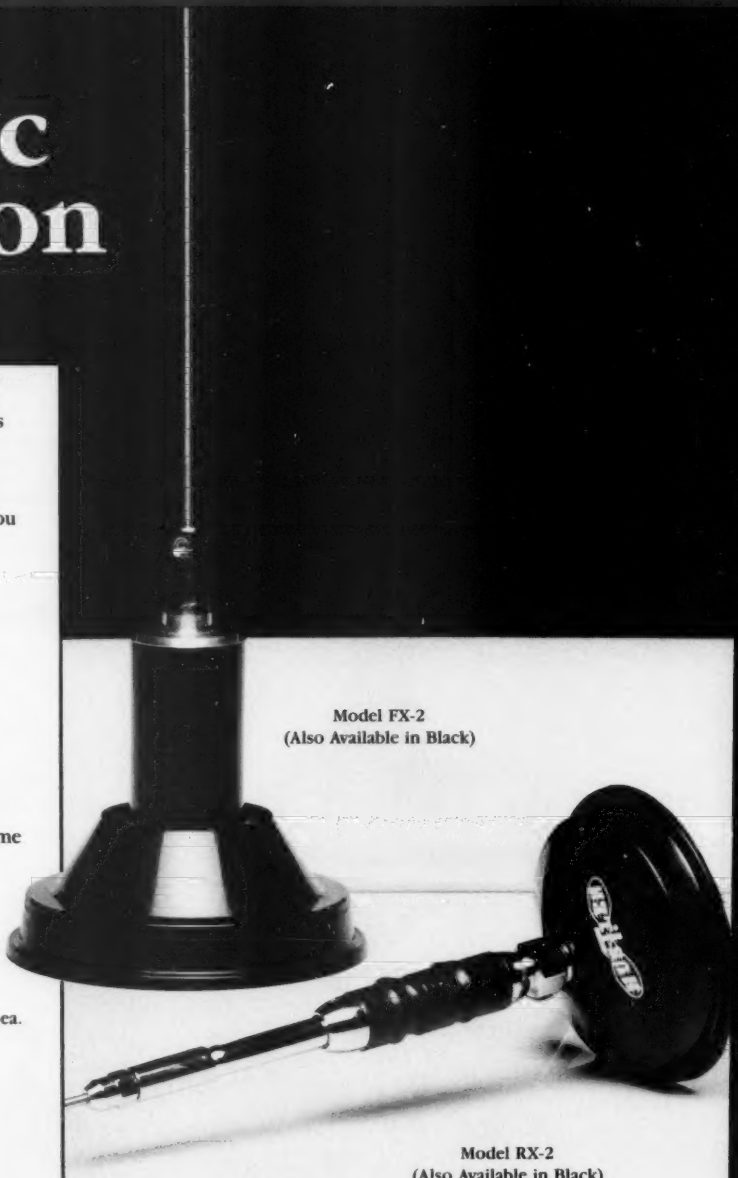

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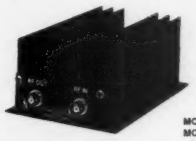

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THE PROBLEM

OK, let me get this straight. Your HF transceiver has a bandswitch with 8 positions, but you have room for only one or two antennas. Even if you had the space for several antennas, you couldn't afford the coax to feed them after straining the family budget to get that tower and tribander. Besides, somehow your spouse got the idea that that tribander was going to be the antenna, "so why do you need all those ugly wires running all over the yard?" A dipole fed with open wire line through an antenna tuner is one possibility, but you don't have a tuner and open wire line can be a bit of a hassle. A trap dipole is another way of dealing with this situation, but traps can be a little spendy and they are sometimes tricky to build. Are there any other possibilities?

One alternative is to feed several dipoles that are connected in parallel with a single coax feedline. I've built several such parallel dipoles, but as noted elsewhere (Grebenkemper, QST, May 1985), parallel dipoles typically have a narrower bandwidth than trap dipoles do. Also, being in close proximity to one another, they tend to interact and you can end up with some combinations where you can't get a reasonable SWR no matter how much antenna pruning you do. This is especially likely to happen when the bands involved are relatively close to one another in percentage terms. For example, I recently built a 20/15m combination using 300-Ω twinlead (Figure 1), and although the antenna worked great on 14 MHz, I couldn't get the SWR below 2:1 on the higher band despite numerous rounds of lowering, trimming, and raising the antenna. However, a little time spent at the library and with a soldering iron cured my problem. Here's what I did.

A Solution

I came across a paper that reported good success with parallel dipoles when a capacitive balun was connected across the antenna's input terminals (Hately, "Multiband Dipole and Ground-Plane Antennas," in Third International Conference on HF Communications Systems and Techniques, IEE, London, 1985, pp.102–106). An example of such an antenna appears in Figure 2. The capacitors at the antenna feedpoint are chosen so their reactance is equal to the impedance of the coax feedline at the frequency of interest. When operating on the highest frequency band, only capacitors C3A and C3B are involved, along with the dipole formed from L3A and L3B. On the next lower band C2A and C3B are effectively in parallel. Their combination (and C2B, C3B) is chosen to have a reactance (at this lower frequency) equal to the coax impedance. Finally, on the lowest frequency band, C3A, C2A and C1A (and C3B, C2B, C1B) act together to supply the necessary capacitive reactance, while L1A and B resonate as a dipole on that band.

Confused by all those capacitors? To spare you the number crunching, I've calculated the capacitor values required for the 9 HF bands when using 52-Ω coax feed (see Table 1). Note that the table gives the total value of capacitance needed on each band. Once you've supplied the capacitor for the highest frequency operation, a lower band requires only enough additional capacitance to reach the total shown in the table.

For example, Table 1 indicates that 144 pF is needed for 15m operation, and 216 pF on 20m. Therefore, when I built a 20/15m combination, I used a 144-pF capacitor with the 15m section, but only a 72-pF unit with the 20m section, since 144 + 72 = 216 pF. A 80/40/30m combo would have 303 pF capacitors for the 30m section, 125-pF capacitors for the 40m section (303 + 125 = 428 pF), and 377-pF capacitors for the 80m section (303 + 125 + 377 = 805 pF). You can use the information in Table 1, therefore , to arrive at capacitor values for any combination of parallel dipoles in the HF band.

Roll Your Own

The capacitors you use can either be of the commercial value (rated to handle the expected current and voltage), or homemade. Making your own is not as difficult as you might think. As you can see in Figure 2, the capacitors all have one plate in common, and that plate is connected to the shield of the feedline. With my homemade capacitor, that common plate is one side of a double-sided copper-clad board. The other plate of each capacitor is etched (or cut out with a hand-held grinding tool) on the opposite side of the copper-clad board. I also etched some additional small areas on the non-ground side of the board in case I needed to add some capacitance to the system. (I didn't). My capacitor, in the testing phase, appears in Photo A. Prior to permanent installation, of course, a more sound mechanical arrangement than that shown in the photo should be arranged, and the capacitor should be located in a waterproof housing.

The area of copper-clad board necessary to obtain a given value of capacitance will depend on the characteristics of that particular type of board. If you have an LC meter, or if you know the dielectric constant for the board and the separation between layers of copper, you can calculate the surface area needed for a given value of capacitance. However, I got my board from a surplus dealer and I

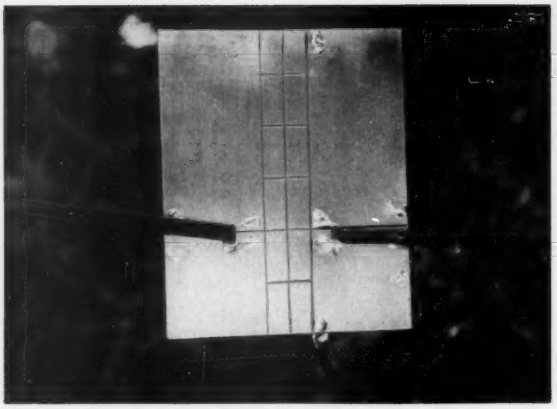


Photo A. Copper-clad board capacitor for the parallel dipoles.

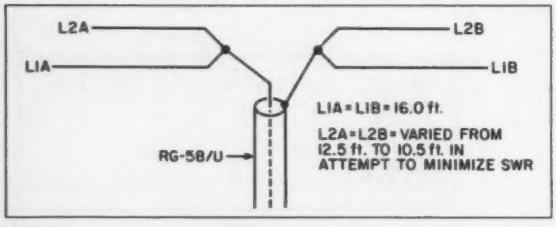


Fig. 1. Parallel dipole antenna for 20- and 15-m bands constructed from 300-Ω twinlead. Performance was good on 14-MHz, but unacceptable at 21 MHz. See text for details.

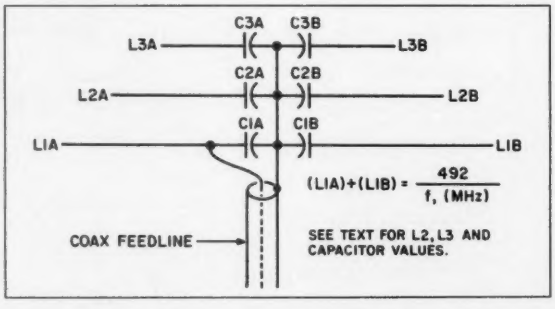


Fig 2. Parallel dipole antenna with capacitive balun. Note that the center conductor of the coax is connected to only one side of one capacitor, while the shield is common with one side of all the capacitors.

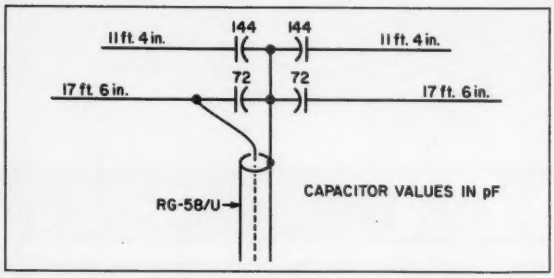


Fig 3. Parallel dipole with capacitive balun feed for the 20 and 15-m bands. Elements are made of 300-Ω twinlead cut to the lengths shown. This antenna provided a low SWR at both 14 and 21 MHz, unlike the arrangement shown in Figure 1.

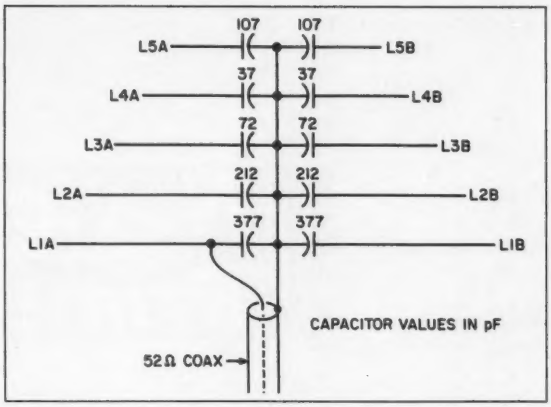


Fig 4. Parallel dipole with capacitive balun feed for the 80/40/20/15/10-m bands. Such an antenna could be constructed from 5-condutor rotor control wire.

knew nothing about its characteristics. Still, I had no difficulty making the capacitors.

First, I took a section of coil stock and soldered an end to each side of the virgin circuit board. Using a grid-dip oscillator, I found the resonant frequency of this LC circuit. I then removed the coil from the board and soldered a capacitor of known value across the leads of the coil, and again found the resonant frequency. Some simple calculations then yielded the capacitance per square inch of the circuit board.

Specifically, I placed a 9-turn coil, 1 1/2" diameter, 1 1/4" long (dimensions are unimportant, just don't change the coil once you start this), across a fairly large sheet of double-sided board. Its resonant frequency was 1.73 MHz. I then removed the circuit board and replaced it with a 680-pF silver mica capacitor. The frequency was 3.80 MHz. Dividing 3.8 by 1.73 and squaring the result yields 4.825. Since the circuit board/coil combination gave the lowest frequency, I multiplied that 4.825 by the 680 pF and got 3280 pF as the capacitance of my board. (Had the circuit board/coil pair produced the highest frequency, I would have divided 680 by 4.825). Dividing the area of the board by its capacitance gave a value of 18.56 pF per square inch. Therefore, to make a 185.6-pF capacitor, I would need 10 square inches of copper.

Frequency	Total C (pF)
28.5	107
25.9	118
21.3	144
18.1	169
14.2	216
10.1	303
7.15	428
3.8	805
1.8	1700

Table 1. Design information for parallel dipoles with capacitive balun and 50-Ω coax feed. The total capacitance column indicates the value of capacitance that should appear each side of center for a given band of operation.

"If you've tried parallel dipoles before with limited success, maybe you should give this method a whirl."

For my 20/15m antenna, I needed two 144-pF capacitors and two 72-pF caps. Since each square inch of my circuit board provided 18.56 pF of capacitance, that meant I needed two areas of about 7.75 square inches each, and two of 3.9 square inches each. The actual shape of those areas is unimportant so long as their areas are correct.

Anybody There?

Are you still with me? Believe me, it takes longer to describe the process of making those capacitors than it does to actually manufacture them. Sure, you can go buy some capacitors, but even then you may have to make some series/parallel combinations to get the required values. By making my own capacitors I was able to get just the values of capacitance I needed, plus it was cheap and worked the first time I put it on the air. That's hard to beat.

A few comments on the lengths of wire required for the dipoles. Normally when we make a half-wave dipole it is cut according to the formula length (feet) = 468 ÷ frequency (MHz). However, as noted in Figure 2, when using this antenna you need to use length (feet) = 492 ÷ frequency (MHz) to calculate the length of the lowest frequency dipole. This change is necessary due to the effects of the capacitors at the antenna input terminals.

With my 20/15m antenna, that meant a length of 17.5ft each side of center for the 20m dipole (resonant frequency 14.050 MHz). Hately stated that the other dipoles in one of these systems need to be lengthened 5 to 15 percent due to the "parallel inductance" effect caused by the other nearby conductors. With my 2-band antenna, however, resonance on 21 MHz was achieved with a length 3% greater than the traditional 468 x frequency value, or 22' 8" overall for 21.3 MHz.

So where are we? Figure 3 shows the completed 20/15m parallel-wire dipole. The antenna was raised to 32 feet above ground and worked well, with a good SWR across both 20 and 15m, on the first try. It did not require any adjustment of capacitance from the calculated values. I suppose I could wave my hands and explain why this second arrangement of parallel dipoles worked when the combination lacking the capacitors wouldn't. But I'm not sure that I'd convince either of us. Regardless of how it works, if you've tried parallel dipoles before with limited success, maybe you should give this method a whirl.

Other Ideas

This method could also be applied to vertical antennas. Hately claimed that multiband quarter-wave ground plane antennas using this technique outperformed other verticals that used "tuned traps and loading coils." It should be possible to design multiband VHF/UHF whips, with the capacitors formed gamma-match style from telescoping tubing. Or perhaps one of you readers has a better idea. Any takers? 73

Frequency (MHz)	SWR:1
3.6	1.45
3.7	1.22
3.8	1.80
7.0	1.20
7.05	1.12
7.1	1.25
14.0	1.40
14.2	1.19
14.3	1.40
21.0	1.23
21.2	1.33
21.4	1.55
28.0	1.55
28.5	1.02
28.8	1.42

Table 2. SWR figures for a 5-band parallel dipole antenna, 50-Ω system, with capacitive balun (from Hately).

by Chod Harris VP2ML

Novice DX Primer

Tips for Novices to Work the World on Voice

DX. The mere mention of the word starts the heart pounding and the blood rushing. DX has always been a pinnacle of amateur radio; the peak toward which many hams climb throughout their amateur career. And now, thanks to Novice Enhancement and increasing sunspot numbers, DX is well within the reach of every Novice and Technician.

Ten meters is one of the most fascinating DX bands. Even simple antennas and low-power stations can talk around the world on 10 meters when the band is right. Today's Novices have probably heard how hot this band was during the last sunspot peak. At its best, DXing on 10 meters is arm-chair easy, but even prime band conditions require some thought and skill. Ten meters is an excellent training ground for new DXers. Antenna and power requirements are not as great on this band as, say, on 20 meters. Stations are more spread out than on 20 meters, a real boon to the low-power station. So, let's see how to cash in on 10-meter SSB DX.

The Station

Any station capable of making a local contact can make a DX contact on 10-meter SSB. A little attention to detail, however, will greatly increase its DX-effectiveness.

Check out your rig. Many amateur transceivers exhibit a reduction in output power on 10 meters. Make sure your rig puts out the power it should. Next, check your microphone gain and processor level. A signal with poor audio quality might make local contacts, but in the DX pileups and over long radio paths, only the clearest audio penetrates. Find another ham at least a few miles away to listen to your signal. Gradually increase the mike gain until your signal stops increasing in strength. Any more gain and you're inviting distortion, and poor DXing. Do the same with the speech processor, if any. Increase its gain until the signal starts to distort, and then back it off. Judging by signals in DX pileups, many hams think they can get through better by turning up their mike gain. The opposite is true.

Once your rig is tuned up, check out your antenna system. Although any antenna will work for DX, the better the antenna, the more DX you will work. A rotatable beam antenna is best, and used CB yagis are often available. Trim 5" off each end of each element, wire in new coax, and put it on a TV rotator. A 10-meter dipole can also put out a good DX signal.

Whatever antenna you use, try to get it at least 30 feet in the air. For DX contacts, you want to keep the angle of radiation of your signal as low as possible, for maximum signal strength over long distances. Thus your horizontal antenna should be at least one-wavelength high, or about 30 feet at 10 meters. A TV push-up mast, carefully guyed, can support a small 10-meter yagi. A dipole should also be as high as possible, for the same reason.

> *"Ten meters is one of the most fascinating DX bands."*

Vertical antennas concentrate much of their signal in low angles of radiation. Thus, a properly installed vertical, with radials, out in the clear, can be an excellent DX antenna. A 10-meter vertical is a space-saver at only about 8 feet tall.

Propagation

Once your station is ready, you need to figure out when to DX. Ten meters is a notoriously fickle DX band. It can be wide-open around the world at one time, and completely void of DX an hour later.

Fortunately, you can easily determine if 10 meters is open for long-haul DX contacts. Tune between 28,200 and 28,300 kHz and you'll hear a host of beacons in every corner of the globe that indicate band openings. The propagation charts and forecasts in the various amateur radio magazines will suggest good times to check 10 meters. Shortening skip on 15 meters is a sign that 10 is about to open. In other words, if stations near you are increasing in signal strength, check the next higher band for activity. You can also ask other amateurs on the band if any DX is coming through.

Even with low sunspot numbers, 10m often proves fruitful for north-south contacts. US hams should check for signals from the Caribbean and South America. Turn the beam south and tune across the entire band for signals, not just the Novice portion. Novices can work more than half way to DXCC or DX Dynasty with north-south contacts. Count how many countries there are in the Caribbean and South America!

The most reliable way to check 10 meters is to call CQ. Never give up on 10 meters after tuning quickly across the band and not hearing anything. Often 10 is open but, because everyone is listening and no one is transmitting, the band sounds dead. Try a series of short CQs in the direction of the sun before you quit. Not one long CQ, but a series of very short CQ DXs with ample listening between the series.

Listening, Listening

The single most important information piece of equipment for DX is a good ear. A successful DXer spends about 90% of his or her time receiving. Listen first to the whole band. Is it active? Are signal strengths good? Where is the activity concentrated? Then listen for individual DX callsigns. What country or part of the world are they from? The well-tuned ear can yield a great deal of intelligence about band conditions. The DXer then sets up a strategy to snag that rare one.

Once you have isolated a single DX station you wish to contact, listen carefully for his exact callsign, location, name, and QSL in

formation. Be sure to listen to both sides of the DX contact. Whenever you can hear both the US station and the DX station, you increase your chance of a successful DX QSO. Determine the exact frequency on which the US station is transmitting. This is more important than sending on the DX station's frequency. You want to transmit where the DX is listening.

Then listen to what kind of calls the DX station responds to. Is it the last callsign in the pileup? The first? The fastest? The best phonetics? If you can discern a pattern in the way the DX station responds, try that same technique and increase your chances for a successful contact.

You should also listen outside the 28,300–28,500 kHz range, especially in the DX segment from 28,500 to 28,600 kHz. The presence of US Novices will gradually pull many stations below 28,500, but meanwhile listen for DX signals above that frequency. If you hear some choice DX, ask a higher-class licensee to go up and ask the DX station to move down into the Novice subband. Many would be pleased to comply.

Logging and QSLs

Once you complete your contact with the DX station, you'll want to obtain a QSL card as a permanent memento of the contact and, more importantly, as proof of the QSO for the various DX awards. The first step toward confirming your DX contact is complete, accurate logging.

Although the FCC requires only a minimal log, a DXer soon learns the value of a comprehensive, detailed record of DX contacts. In addition to the obvious information of date, time, exact frequency (not simply band), name and QTH, the DXer will note overall band conditions, callsigns of station called but not worked (they may well be on the same frequency at the same time another day), the power and antennas of the DX stations (does it take a kilowatt and a large beam to produce a weak signal at your location?), and many other notes.

When you are lucky enough to work a station for a new country, you'll want to log even more information. To increase your chances of getting a return QSL, you might want to give the DX station a detailed description of band conditions and how his signal compared to others on the band at the same time. Observations such as, "Yours is the only signal from Middle East—Europe very loud," or "Loudest Caribbean on band," are useful to the DX stations.

"Whatever antenna you use, try to get it at least 30′ in the air."

Always keep your log in Coordinated Universal Time (UTC). DXers keep their shack clock on UTC and check it against WWV regularly. A DX station might fill a log page in 5 minutes. If the time on your QSL is more than a minute or two off, he might not find your contact. Some DX stations can draw huge pileups and work several stations a minute. An incorrect time on your QSL could put your contact several pages away from where it should be! And pay particular attention to the UTC date, which advances in early evening in the US. QSL managers consistently report that more than 20% of all the cards they receive have the wrong time or date.

The subject of confirming DX contacts can (and does) fill books. Many of the details of preparing the envelopes, using International Reply Coupons (IRCs) or Green Stamps (US $1 bill), and finding correct DX addresses has been published elsewhere. Two items sometimes overlooked by the new DXer are maintaining good records of your QSLs sent, and keeping envelopes at your incoming QSL bureau.

If you keep careful track of when, to whom, and how each QSL was mailed, you'll better be able to follow up lost cards. Again, you DX logbook is an excellent place to keep these records. You will undoubtedly start receiving QSL cards via the bureau system, some months after you start making DX contacts. Complete details on the free incoming bureau system are available from ARRL Headquarters in Newington for a self-addressed stamped envelope. Follow the simple rules about maintaining envelope or postage credits at your district bureau to speed bureau cards to you shack.

The 10-meter band will improve every month for the next few years, before conditions level off and start to decline in the early 1990s. The next year or two will be an exciting time to chase DX on 10 meters. Before you know it, you'll be a DXer.

How will you know that you've become a DXer? A DXer always knows exactly how many countries he or she has worked, and how many of them are confirmed. Once you start to count your countries, you're in the fraternity. Good DXing!

Chod Harris VP2ML has been licensed for 20 years and has written the DX column for us since 1983. Chod earned his first DXCC on 10 meters at the bottom of the last sunspot cycle. He publishes the DX Bulletin in Santa Rosa CA. His address is PO Box 4881, Santa Rosa CA 95402.

Ten Meter Beacons Live Here

Frequency	Callsign	QTH	Frequency	Callsign	QTH	Frequency	Callsign	QTH
28.050	PY2GOB	Sao Paulo	28.232	W7JPI	Sonoita	28.270	ZS6PW	Pretoria
28.175	VE3TEN	Ottawa	28.2325	KD4EC	Jupiter FL	28.270	VK4RTL	Townsville
28.195	IY4M	Bologna	28.235	VP9BA	Southampton	28.2725	9L1FTN	Freetown
28.200	GB3SX	Crowborough	28.2375	LA5TEN	Oslo	28.275	AL7GQ	Jackson MS
28.200	KF4MS	St. Petersburg FL	28.240	OA4CK	Lima	28.2775	DF0AAB	Kiel
28.2025	ZS5VHF	Natal	28.2405	5Z4ERR	Nairobi	28.280	YV5AYV	Caracas
28.205	DL0IGI	Mt. Predigstuhl	28.2425	ZS1CTB	Capetown	28.280	LU8EB	Tandil
28.2075	W8FKL	Venice FL	28.245	A92C	Bahrain	28.285	VP8ADE	Adelaide Island
28.208	WA1IOB	Marlborough MA	28.2475	EA2HB	San Sebastian	28.286	KA1YE	Henrietta NY
28.210	3B8MS	Mauritius	28.248	K1BZ	Belfast ME	28.287	H44SI	Honiara
28.210	K4KMZ	Elizabethtown KY	28.250	Z21ANB	Bulawayo	28.287	W8OMV	Ashville NC
28.212	ZD9GI	Gough Island	28.253	WB4JHS	Durham NC	28.288	W2NZH	Moorestown NJ
28.215	GB3RAL	Slough	28.255	LU1UG	General Pico	28.290	VS6TEN	Mt. Matilda
28.2175	B9YMY	Oklahoma City OK	28.2575	DK0TE	Konstanz	28.2925	LU2FFV	San Jorge
28.220	5B4CY	Zyyi	28.260	VK5WI	Adelaide	28.299	PY2AMI	Sao Paulo
28.222	W9UXO	Chicago IL	28.262	VK6RSY	Dural	28.315	ZS1LA	Still Bay
28.2225	HG2BHA	Tapolca	28.264	VK6RWA	Perth	28.888	W6IRT	North Hollywood A
28.2275	EA6AU	Mallorca	28.266	VK6RTW	Albany	28.890	WD9GOE	Freeburg IL
28.230	ZL2MHF	Mt. Climie	28.268	W9KFO	Eaton IN	28.992	DL0NF	Nuernberg

QRP

Number 39 on your Feedback card

Low Power Operation

Mike Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

6L6 SPECIAL UPDATE

As promised, here's the 6L6 special update. It started out as just a weekend project to satisfy Father Radio that I really could build something with a tube in it, and ended up firing up a lot of QRP operators. I'm still getting letters from the column in the May 87 issue of *73 Magazine*. I saved some of them for the update.

Many people wrote about the screen circuit. The way I generate the screen voltage saves me the trouble of using a separate screen supply. The 1938 *QST* article by Fred Sutter W8QBW used a separate screen supply. Richard Bell WA4BNO sent in the screen circuit shown in Figure 1. Notice that he is running 300 volts on the plate. My power supply had a bit more kick, and if your plate supply is also higher than the 300 volts Richard uses, you may want to fudge the resistor values a bit.

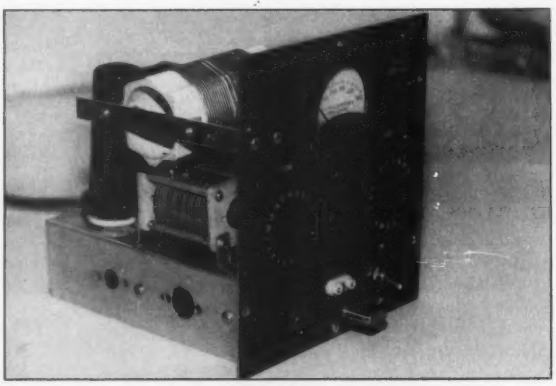
What's this? You don't have 50-kΩ, 10-Watt resistors? Well neither did I, and I didn't want to make a pest of myself at Father Radio's house. ALL Electronics has a very good selection of high-watt resistors at very low prices. If they don't have just what you need, you can always mix and match using Ohm's law to calculate the values.

Cathode Keying

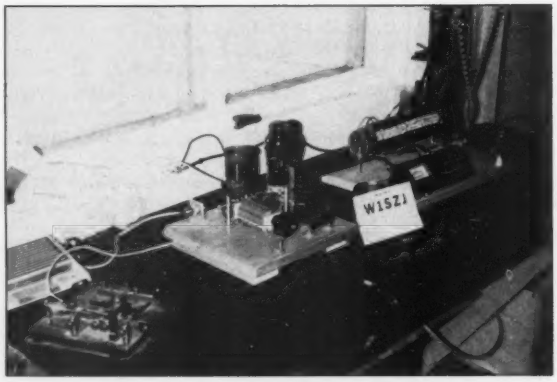
The keying method of the 6L6 Special—cathode keying—is very old and very basic. You ground the cathode of the tube and the tube conducts. If you're having a bit of trouble keying the rig, increase the capacitor on the key line from .01 to .02. You can also add a resistor in series with the cathode. Try 100 Ohms at 12 Watts or so. I'm sorry to say you can't use your fancy hi-tech electronic keyer with the 6L6, since the switching transistor will not survive the current nor the high voltage that is present on the cathode of the 6L6.

This leaves only three ways to key the transmitter. You can use the old straight key and not worry about the trouble. You can also use a Vibroplex bug. (I never could master one of those things. My CW came out sounding like someone was choking a drunk monkey!) You can also try special transistor switching.

Finally, there's relay keying. Figure 2 shows a circuit that *should* work with the 6L6 Special, but I haven't yet tried it. The circuit is very simple. The heart of the circuit is the horizontal output transistor, which withstands high voltages and can switch several amps of current. This is a slightly modified version of a basic circuit from the *ARRL Handbook*. When you ground the base of the 2N2905, you turn on Q2. Q2 then grounds the cathode of the tube. The resistors and capacitor in Q2's base will shape the wave. You will have to experiment with the values for the best looking wave. You do have a 'scope, don't you?



The 6L6 Special, built by Arliss W7XU.



Dave W1SZJ's version.

John W1YUZ's version.

Radio Shack sells a replacement horizontal output transistor, but it goes for about $8. Look for one in surplus or at a hamfest and buy several for the junk box.

You can use a heavy-duty relay to key the transmitter. The drawbacks here are that these relays can't follow high-speed CW coming from your electronic keyer, and they are really noisy. I solved this problem many years ago when I came across a mercury-wetted relay. I use it to key one of my home-brew transmitters that also used cathode keying. The relay will switch anything! You might also find one of these rooting around atsurplus houses and hamfests, and in junk boxes.

This particular relay has a 12-volt coil, so I built up a circuit that looks like the one in Figure 2. I just replaced the tube with the relay coil and removed the RC network. When you ground the keyline, the relay pulls in, which in turns grounds the cathode of the tube. This method is how I have been keying my version of the 6L6 Special. Here I connected my relay driver to my Color Computer for computer-generated code!

One more question about the keying of the rig: what about sidetone? I just use the built-in tone on my home-brew keyer. The Color Computer will also generate its own sidetone. I have seen circuits that will generate a sidetone by sampling the RF from the transmitter and they generate a tone, but I've never been much impressed by them.

A lot of builders wrote to say they changed from the PI-output back over to the link output. That's fine with me. Most of you did, however, use a plug-in coil set up to change bands.

Remember, you are working with an oscillator. Several builders have written to me about yoopy-sounding tones. Remember here to not load the tube for maximum output. Listen to your tone as you tune up. You will notice the tone of the CW

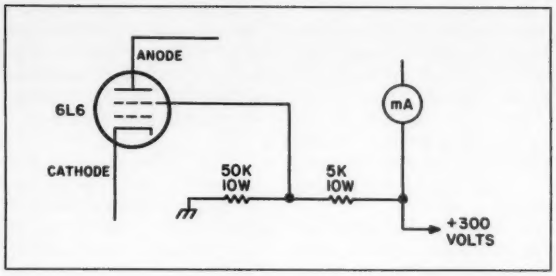


Fig. 1. Different screen circuit for use with the 6L6 Special.

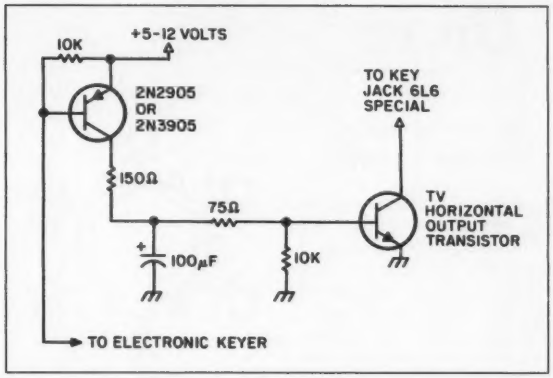


Fig. 2. For interfacing with an electronic keyer, try this circuit.

change as you load, and peak the 6L6. Go for the best-sounding CW note instead of maximum power output. Old sluggish crystals will also give a bad CW tone—try newer rocks.

A Bit of Sharing

Some of you have asked about setting up a special frequency for the 6L6 Special. Let's try the QRP calling frequency of 7.040, Jan Crystals sell the FT-243 crystals for about $2.50 each.

That should take care of most of the questions that have come up on the 6L6 Special. Now as promised, some of your handywork. Who says hams don't build anymore?—check out the QRP operators.

Arliss Thompson W7XU sent in a photo of his 6L6 Special (Photo A). Arliss uses the metal version of the tube. He notes that "the holes in the side of the chassis are from some long- (and probably best-) forgotten project." The transmitter was removed from its box for the photo. A fine job, Arliss!

John Ormsbee W1YUZ built his version using the old breadboard design. The PI-network features a B & W plug-in coil for 40 meters. Two 6L6s are used, one for the oscillator and the second for the amplifier. There's 300 Volts on the plate of the final, and it puts out about 8–9 Watts. With that BC-348-K receiver, that's quite a station.

Dave W1SZJ also built his 6L6 Special on a piece of wood. The "L"-tuner, 135-foot wire, and 8-Watt output from the transmitter pack a good punch.

Everyone built their version using what they had. I wish I had the time to build some of the versions sent to me! Most use a separate oscillator, buffer, and then a 6L6 for the final. The 6AG7 seems to be the tube of choice for the oscillator. Some of the circuits even include grid-block keying and special regulated power supplies, complete with the regulated screen supply. Not bad for a 50-year-old idea!

Odds N' Ends Dept.

By the time this column hits your mailbox, Paula Franke WB9TBU will be the new editor for the QRP ARCI publication, the *QRP Quarterly*. Paula will be looking for articles for the *Quarterly*. She works with IBM-PCs and can work with WordStar™, WordPerfect™, and Microsoft Word™ word-processing programs. In addition, she can read ASCII files, which saves an enormous amount of time keyboarding text. Articles on all aspects of low-power communications are welcome.

Serious QRPers should consider joining the QRP ARCI. New memberships are $12, and renewals are $10. Send your check or money order to Membership Chairman Bill Harding K4AHK, 10923 Carters Oak Way, Burke VA 22015.

This year marks the 10th anniversary of the Michigan QRP Club. Their 8th Annual CW contest starts on January 16, at 1200Z, and runs through January 17 at 2359Z. This is 36 hours of CW-only contesting on 160 through 10 meters, excluding the WARC bands. The contest is open to all amateurs and all are eligible for awards.

The exchange is as follows: RST, QTH, M-QRP Membership number (non-members send power output). There are three classes of operation with bonus points for power output and for battery/natural power. For more information about the contest, please send a large SASE to L.T. Switzer N8CQA, 654 Georgia, Marysville MI 48040. A set of log sheets and one entry form are available for a SASE to K8DD, 1640 Henry, Port Huron MI 48060.

While I don't have all the details, the Michigan group plans many anniversary specials. Now would be a good time to help the club with your membership!

One last item. The antenna special sure got a lot of people upset about my stand with the vertical antenna. (One guy even sent me a dead spider in the mail!) I also offered all those who wrote to say I don't know a thing about vertical antennas the chance to tell the world via the QRP column. I received many letters about vertical antennas, but the one Skip WB8OWM sent to me says it all:

"I take exception to your views on the HW-7 and vertical antennas. I've managed to work over a hundred countries with my K-Mart lantern-battery-powered HW-7 and vertical antenna. The gods of Newington for some reason continue to mount their verticals on the ground. Perhaps they're confused about "low angle of radiation." . . . "Over the years I have learned through experience that our hobby is full of French words. For example, QUAD. Quad is French for 'comes down in winter.' BALUN is another French word. BALUN means 'RF transformer/ RF loss.' I'd say at least .2 db of loss. That's why I use a Budwig center insulator—no loss. It's also a waterproof way of connecting the coax to any dipole."

Like most of the others who wrote to me about the vertical, Skip also wrote to say that the verticals will work best if mounted out of the way of buildings, trees, and other objects. Radials from a tower-mounted vertical will add extra kick to the antenna. Perhaps there is enough information that needs to be shared on this subject that I should devote a month just to the vertical antenna. Please, no more dead spiders!

"Go for the best-sounding CW note instead of maximum power output."

Two-Fer Errata

Several bits of information were dropped on the November column about the Two-Fer. For those who want a circuit board or semi-kit, the parts placement guide, or if you have any other questions about the column, drop me a line with a SASE.

There were also a few errors. Reverse the 80- and 20-meter coil values for the filter. The schematic shows a MFP102; it should read MPF102. Also, the capacitor on the 12-Volt supply for the PA transistor is 10 instead of 18 μF. As well, the resistor on the base of the PA transistor is 33Ω, not 93Ω.

Next month look for the QRP 5'er. And no, it's not what you think. There will be some good reading coming down the pike this year here in the QRP column!

OP-ED

by Larry Ledlow, Jr. NA5E

Modern Mythology and Amateur Radio

I've had an interest in radio for as long as I can remember. Radio listening became my main hobby twenty years ago, and eventually the ham bug bit me very hard. Radio has usually figured heavily in a lot of big decisions in my life. Radio physics and astronomy kept my interest up through college, and I pursued a very successful career in radio science with Uncle Sam before I came to *73*. Amateur radio, though, has provided most of the truly rewarding experiences in my life through intellectual stimulation, the satisfaction of serving the public, and a sense of international, fraternal order.

There are plenty of folks pitching *status quo*, a dangerous idea that promotes complacency and therefore guarantees amateur radio a mediocre place in the history books. At the same time, soothsayers of gloom and doom would have us believe ham radio is all but washed up in a technological torrent that has left us far behind the power curve in advancing radio state-of-the-art. I have serious misgivings about these two extreme views, which both stand firmly on certain mythical ideas about amateur radio.

Fallacies Abound

Myth number one: *There exists a generally accepted definition of "average ham."* Think about how silly this idea really is. There are more than 1.5 million amateur radio operators in the world. They come from all walks of life, speak hundreds of different languages, and have an enormously wide variety of interests, both related and unrelated to radio. Now, you tell me who, out of all those people, is an "average" ham.

First of all, I don't know anyone who wants to be average. That aside, to assume there is an average ham, even in our collective imagination, who fairly represents the entire amateur radio operator population is . . . well, silly! That's like saying there is an average snow flake. Sure, you can make some accurate statements about snow flakes in general. They're white, six-sided water crystals, but try to define an *average* snow

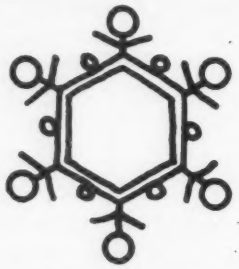


Fig. 1 Generic Snow Flake

flake. You can make a lot of sweeping statements about hams, but don't *ever* tell me you've managed to define the average ham.

Could we say the average ham is Japanese, owns 2.675 radios, drives a Toyota, and only operates 2.347 hours per week on 40-meter RTTY? Nope, and we couldn't say anything else meaningful about our mythical average ham.

Oversimplification of a problem—in this case, defining the average ham—is the first step to the wrong conclusion. We must recognize the amateur radio population at large as an incredibly diverse group, whose only true, common interest is radio. Any attempt to boil down hams' interests and abilities into just a few words is pure, unadulterated fallacy. If you agree there is not an average ham, then immediately all the prophetic statements about ham radio that use the term become invalid and meaningless.

Something New, Something Old

This brings us to myth number two: *Amateur radio offers nothing new*. If you haven't done something before, then it's new. Therefore, ham radio holds plenty of new adventures for most of us. There aren't too many hams around who have done it all and seen it all. The challenge of a new mode or band can be inspirational.

Back when unlicensed, shortwave listening (SWLing) was the only game I played, I always got a thrill when I heard a new country or a rare broadcast station. I still get a kick when I work a new country on the ham bands, but I find a lot of joy trying out communication modes that are new to me. KA1HY and I recently made our first contacts on the Russian RS-10 and -11 satellites. Great fun! Both of us relished our triumph, and we celebrated with pizza and beer. Cynics may point out that a satellite contact these days rates pretty low on the universal scale of novelty. I would argue that fun and education are on the bottom line. Bryan and I had fun and learned something new.

New modes and construction projects are two obvious ways to spice up your ham life. How about folding your other interests into ham radio? Start or join a net with others interested in scuba diving, ballooning, gemology, foreign lan-

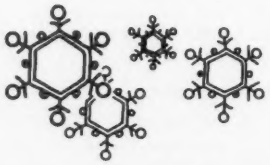


Fig. 2 Snow Flurries

guages, or anything else you want to learn or talk about. Remember how we dispelled myth number one. Hams are a big group with lots of interests represented. Getting on the air is a lot like going to a party. Eventually you run into someone you'd like to spend more time with.

I carry this argument further by debunking the corollary to amateur radio myth number two: *Ham radio offers little, if anything, for "outsiders."* Wrong again. This hobby suffers in part from bad (or incomplete) press. I maintain that because hams are such a diverse group, just about anyone can find something appealing about the hobby.

However, I can see why the local volunteer firemen can't muster a lot of enthusiasm for ham radio after listening to a discussion on amateur satellites or DXpeditions. On the other hand, they might find a demonstration of the regional repeater network interesting. Even a few pointers on mobile or handheld antennas might raise some eyebrows in the crowd.

Try to pitch packet radio to the local photography club. Yawn. I'll bet the shutter bugs' ears really perk up when you talk about trading snaps with hams all over the world with slow scan TV, though. Mention Tony England's SSTV effort from the Space Shuttle. Now *that's* interesting . . . to the photo club, anyway. Go ahead and pick a group of people to sell on ham radio. With a little thought, you can find an angle to get thementhused about this fantastic hobby.

We hams are guilty of not properly promoting the hobby to nonhams, but that doesn't mean amateur radio fails to offer anything new and exciting for newcomers.

Growing Pains

With all the new hams you'll recruit from other groups, we need to examine myth number three. *Bigger is better.* Not necessarily. A bigger ham population is not the sole prerequisite to a healthy state of the hobby. We need to emphasize quantity *and* quality. A larger ham population brings with it incipient problems like crowded bands and difficult rule enforcement.

We must dispel arrogant notions like operation on 20 meter SSB is a god-given right or that one mode or operating method is more righteous than another. Such ideas simply foster disorganization and counterproductive, if not destructive, acts on and off the airwaves.

We need to encourage newcomers to accept the responsibilities that come with a license and to realize cooperation is the only way to keep the hobby away from bedlam. No, I don't believe in an idyllic, tranquil state for amateur radio either. But constructive criticism and active debate are a far cry from name calling and frequency jamming. Bigger *can be* better, but we have to make it that way.

A Fresh Approach

There are plenty more myths to sweep away. I argue that the myths have polarized the hobby to a great extent. As a result, hams spend so much effort trying to overcome opposing views that amateur radio's progress is retarded. Arrogance, elitism, and self-serving cliques have no place in a hobby that supposedly promotes goodwill amongst fellow human beings (not just the hobbyists).

All is not well with amateur radio, but then all is not bad either. It's time we quit picking sides as if we were going to a tug of war and decided to work together for a change. Esprit de corps, lively debate, and, above all, mutual respect are key ingredients to successful teamwork.

Let's take a deliberate look back, learn from both our triumphs and failures. Then let's chart our course for the future with knowledge, vigor, and optimism . . . and without mythology.

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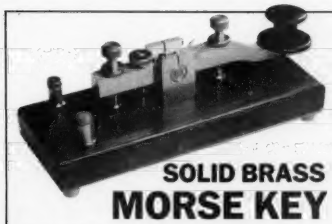

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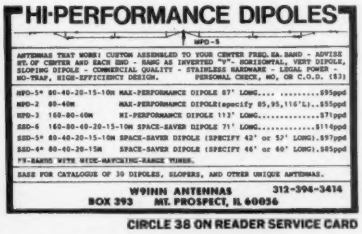

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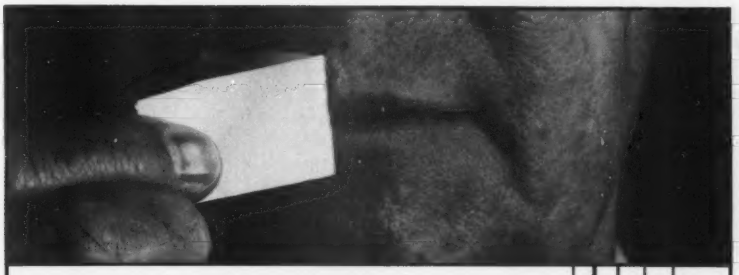

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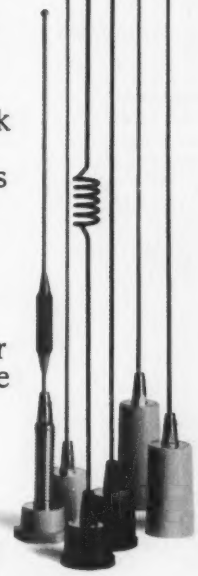

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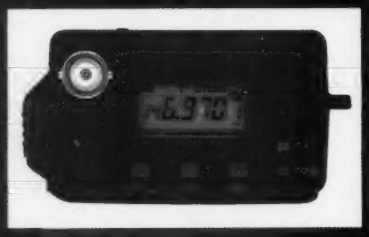

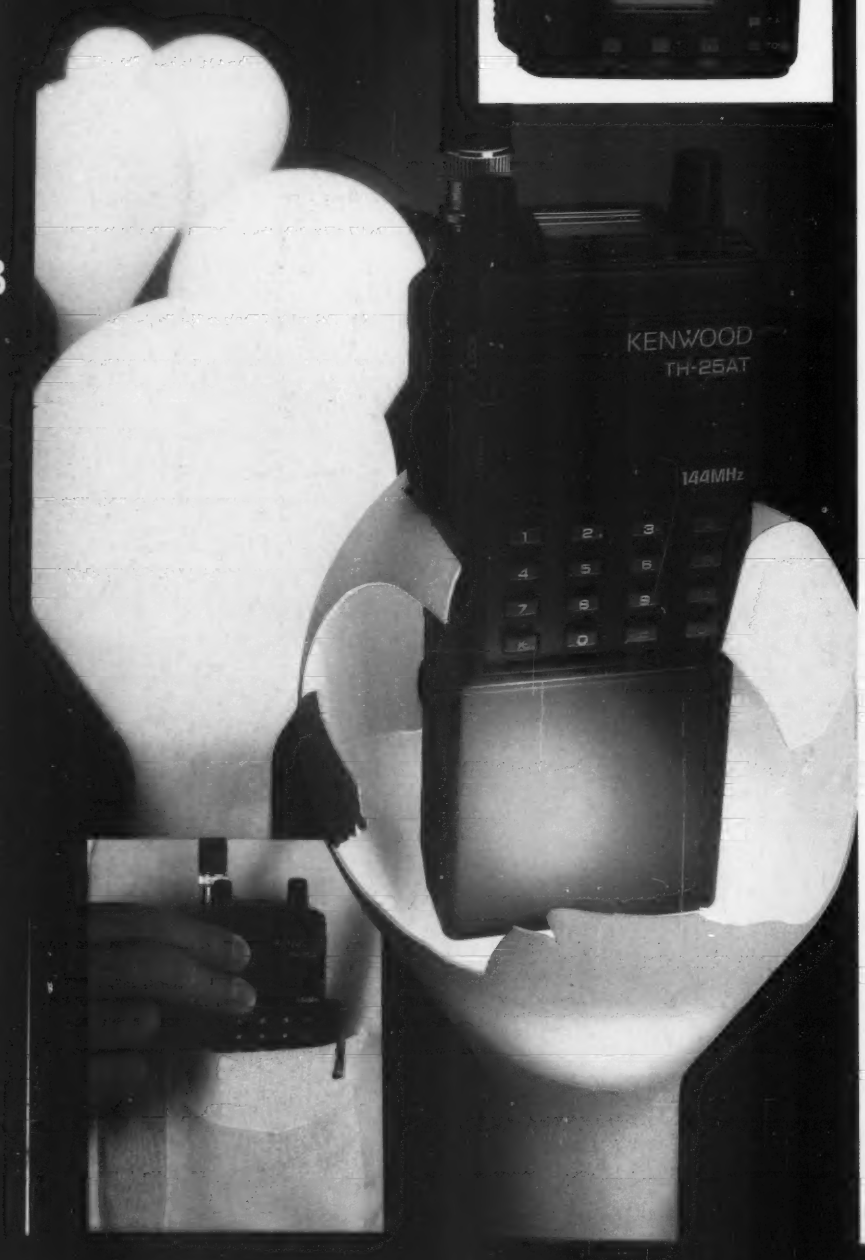

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